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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76- 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., NEW ENGLAND COALITION ON NUCLEAR POLLUTION and CONSOLIDATED NATIONAL INTERVENORS, INC.

Respondents

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

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PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

The petitioner, Vermont Yankee Nuclear Power Corporation, respectfully prays that a writ of certiorari issue to review the judgment and opinion of the United States Court of Appeals for the District of Columbia Circuit entered in this proceeding on July 21, 1976.

OPINIONS BELOW

In the separately bound appendix submitted herewith are set forth the opinion of the United States Court of Appeals for the District of Columbia Circuit (Bazelon, C.J.) in *Natural Resources Defense Council, Inc.* v. *NRC*, Nos. 74-1385 and 74-1586 (*App.*, 1-44), together with the Separate Statement Concurring in Result of Tamm, J. (*App.*, 51-59) and

the Separate Statement of Bazelon, C.J. (*App.*, 45-50). The decision is not yet officially reported. The decisions of the Atomic Safety and Licensing Appeal Board of the then United States Atomic Energy Commission[1] which were on review in No. 74-1385 in the Court of Appeals are reported at 4 AEC 930[2] (*App.*, 60-77) and 7 AEC 159[3] (*App.*, 78-120). The rulemaking proposal, notice of hearing, and notice of promulgation of the rule on review in No. 74-1586 in the Court of Appeals are reported at 37 Fed. Reg. 24191 (Nov. 15, 1972) (*App.*, 121-129), 38 Fed. Reg. 49 (Jan. 3, 1973) (*App.*, 130-132) and 39 Fed. Reg. 14188 (April 22, 1974) (*App.*, 133-148). The General Statement of Policy issued by the Nuclear Regulatory Commission after issuance of the Court of Appeals' decision appears at 41 Fed. Reg. 34707 (Aug. 16, 1976) (*App.*, 149-160).

JURISDICTION

The Judgment of the Court of Appeals was entered on July 21, 1976. The jurisdiction of this Court is invoked under 28 U.S.C. § 1254 and 28 U.S.C. § 2350.

QUESTIONS PRESENTED FOR REVIEW

1. Does the National Environmental Policy Act of 1969[4] impose procedural requirements upon agency rulemaking beyond those required by the Administrative Procedure Act, 5 U.S.C. § 553?

[1] The United States Atomic Energy Commission was abolished by the Energy Reorganization Act of 1974, 42 U.S.C. §§ 5801 *et seq.*, and its licensing and regulatory functions were transferred to the United States Nuclear Regulatory Commission, *id.*, 88 Stat. 1242, 42 U.S.C. §§ 5841 *et seq.*

[2] *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), ALAB-56, 4 AEC 930 (1972).

[3] *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), ALAB-179, 7 AEC 159 (1974).

[4] 42 U.S.C. §§ 4321 *et seq.*

2. Can the National Environmental Policy Act of 1969 be construed, consistently with the Atomic Energy Act of 1954[5] and the Energy Reorganization Act of 1974,[6] to require that licensing of nuclear reactors be delayed until such time as the environmental effects of nuclear waste disposal and reprocessing are "thoroughly ventilated" either in connection with licensing individual nuclear reactors or through a generic rulemaking proceeding?

3. Did the Court of Appeals improperly substitute its judgment for the technical expertise of the Nuclear Regulatory Commission on the basis of matters not within the record before the agency?

STATUTES AND REGULATIONS INVOLVED

The case involves the statutes and regulations listed below, the relevant portions of which are set forth in the Appendix bound separately and submitted herewith (*App.*, 159-262).

1. The Administrative Procedure Act, § 553, 5 U.S.C. § 553 (*App.*, 159-160).

2. The Atomic Energy Act of 1954 as amended, 42 U.S.C. §§ 2011 *et seq.* (*App.*, 161-210).

3. The Energy Reorganization Act of 1974, as amended, 42 U.S.C. §§ 5801 *et seq.* (*App.*, 211-257).

4. The National Environmental Policy Act, § 102, 42 U.S.C. § 4332(2) (*App.*, 258-260).

5. 10 C.F.R. § 51.20(e) (*App.*, 261-262).

[5] As amended, 42 U.S.C. §§ 2011 *et seq.*

[6] As amended, 42 U.S.C. §§ 5801 *et seq.*

STATEMENT OF THE CASE

A. Introduction

Fuel reprocessing and waste disposal constitute the "back end" of the fuel cycle[7] for any nuclear power plant. The cycle itself begins with the mining of ore and follows through each stage in the processing and use of the ore, including reprocessing of the spent fuel, and disposal of long lived radioactive waste. The cycle includes activities at a number of different facilities located at separate sites: for example, the uranium mine itself; the nuclear reactor where the fuel is used, electricity produced, and waste generated; and the separate facilities to which waste may be transported from a number of reactors for reprocessing or disposal.

The issue of the environmental effects of fuel reprocessing and waste disposal was raised by intervenors in the proceeding to license petitioner's Vermont Yankee Nuclear Power Station (VYNPS) at Vernon, Vermont. The Atomic Energy Commission (AEC)[8] initially determined in the Vermont Yankee proceeding that environmental questions involving the "back end" of the fuel cycle were not an appropriate subject for litigation in proceedings to license an individual generating plant. Subsequently, while adhering

[7] The term "fuel cycle" refers to the entire course of events which is involved in fueling, and disposing of waste from, a nuclear reactor. Its constituent parts are mining of ore, milling of ore, enrichment (the process by which the proportion of one of the fissile isotopes of uranium (U-235) is increased), fabrication, transportation to the reactor, shipment of spent fuel to reprocessing facilities (where unused fissile isotopes of uranium and plutonium are recovered, as well as U-238), shipment of waste to disposal areas and disposal. The "back end" of the fuel cycle consists of those operations which occur after the use in the reactor. The "front end" encompasses milling through fabrication.

[8] See note 1, *supra*. For the sake of clarity the old designation "AEC" is used where appropriate.

to that view in Vermont Yankee's individual case, the agency nonetheless began rulemaking proceedings (a so-called "generic" rulemaking) to determine how, if at all, the environmental effects of the fuel cycle should be considered in individual reactor licensing proceedings. After notice and a hearing, the agency determined that these effects, though insignificant, were capable of quantification. Therefore, the agency adopted a rule which established numerical values for the environmental effects of fuel reprocessing and long lived waste disposal attendant upon the operation of a single reactor. These values were set out in a table of numerical computations which the agency directed to be included in the environmental statement for each reactor.

Thus both Vermont Yankee's individual licensing proceeding and the generic rulemaking proceeding involved the agency's consideration of procedures and standards to deal with, and ultimate conclusion concerning, the environmental effects of nuclear waste disposal in connection with licensing individual nuclear reactors. The Court of Appeals set aside the agency's rule and remanded the rulemaking for further proceedings. At the same time the Court of Appeals, treating the licensing and rulemaking cases as interrelated, remanded the order authorizing petitioner's license to await the outcome of the reopened rulemaking proceeding.

B. Agency Proceedings With Respect to Petitioner's Nuclear Power Plant

During the course of the proceedings before the AEC Licensing Board[9] with respect to the petitioner's application for an operating license for VYNPS, the Licensing Board unanimously excluded from consideration in the licensing proceeding the issue of the environmental effects of fuel reprocessing and disposal of long lived radioactive wastes. However, the Licensing Board certified to an AEC Appeal Board questions designed to elicit a ruling as to the proper scope of environmental review to be afforded the "back end" of the fuel cycle. The Appeal Board ruled (*App.*, 76-77) that environmental effects arising from operations subsequent to the delivery of spent fuel and other wastes to either reprocessing or disposal facilities need not be considered in individual reactor licensing proceedings.

The Appeal Board reasoned that, as the only "proposed action" (NEPA, § 102(2)(C)) before the agency was the licensing of VYNPS to operate, NEPA did not require the exploration of the environmental effects of reprocessing or disposal facilities which would be the subject of separate

[9] On December 2, 1966 the petitioner, Vermont Yankee Nuclear Power Corporation, made application to the Atomic Energy Commission for a permit to construct VYNPS. After an adjudicatory hearing, the construction permit was granted on December 11, 1967. On December 31, 1969 petitioner made application for a license to operate VYNPS. On August 10, 1971 adjudicatory hearings were commenced before an AEC Atomic Safety and Licensing Board consisting of two technical members and a lawyer chairman. The hearings finally culminated in the issuance of a full power, full term operating license on February 28, 1973. The decision of the Licensing Board was affirmed as modified by an AEC Appeal Board on February 28, 1974 (ALAB-179, *supra*, n.3) (*App.*, 120). Since October 12, 1972, VYNPS had operated at full power pursuant to a temporary operating license granted under § 192 of the Atomic Energy Act (42 U.S.C. § 2242). VYNPS was the only reactor ever granted a temporary operating license under § 192 of the Atomic Energy Act; the authority granted by that statute has now expired under its terms.

licensing proceedings (*App.*, 67-68); that given the nature of the nuclear fuel cycle and the industry itself, any meaningful exploration of such effects in the context of a single reactor's licensing proceeding would not be possible (*App.*, 68-69); that a contrary ruling would require that there be an environmental analysis of the operation of every reprocessing plant or disposal facility present and future in every reactor licensing proceeding (*App.*, 69) and ". . . could as a practical matter call a halt to the licensing of individual reactors" (*App.*, 71).[10]

The VYNPS licensing hearings proceeded upon the basis of this interlocutory ruling. In the final agency action on Vermont Yankee's license the Appeal Board adhered to its prior ruling noting that its action was dictated by virtue of the pendency of rulemaking.

C. Agency Rulemaking Proceedings With Respect to Environmental Effects of the Fuel Cycle

After the Appeal Board's interlocutory decision in *Vermont Yankee*, described above, the AEC instituted a generic rulemaking proceeding to deal with the question of how environmental effects of the fuel cycle should be accounted for in the "cost-benefit analysis" necessitated in individual reactor licensing proceedings by *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC*, 449 F.2d 1109 (D.C. Cir. 1971).

[10] After the Appeal Board's decision in *Vermont Yankee*, the AEC consistently followed the doctrine there espoused and plants continued to be licensed under the procedures laid down in the *Vermont Yankee* case. In addition, in subsequent cases Appeal Boards excluded similar issues arising out of the "front end" of the fuel cycle from individual licensing cases. *E.g., Long Island Lighting Co.* (Shoreham Nuclear Power Station), ALAB-99, 6 AEC 53 (1973); *id.*, ALAB-156, 6 AEC 831 (1973); *Consumers Power Co.* (Midland Plant, Units 1 and 2), ALAB-60, 5 AEC 261 (1972). See also *Ecology Action* v. *AEC*, 492 F.2d 998 (2d Cir. 1974).

To prepare for the fuel cycle rulemaking, the technical experts of the AEC's Regulatory Staff prepared a report entitled *Environmental Survey of the Nuclear Fuel Cycle* (Nov. 1972) (see *App.*, 124), which described the annual fuel cycle effects attributable to the operation of a typical light-water nuclear power plant, together with the methodology and assumptions used by the Staff in arriving at its conclusions. These conclusions were summarized in a table entitled "Table S-3" (*App.*, 127).

On November 15, 1972, the AEC published a notice of rulemaking containing Table S-3 as part of one of the alternative rules proposed to deal with the pending issue (*App.*, 125-127). The notice called for a legislative-type oral hearing at which all interested persons were invited to become parties and to comment upon the proposal (*App.*, 127-128). The Notice of Hearing (*App.*, 130-132) while precluding interparty cross-examination and formal discovery, did provide for copies of the 1972 Survey to be provided to all persons requesting same.[11]

The hearings were held February 1-2, 1973. All participants, including the respondents,[12] were afforded time to present their comments and information.[13] During the

[11] Also several weeks prior to the hearing the AEC made available in its Public Document Room the background studies, handwritten staff calculations, and superseded drafts of the Survey marked up by the AEC staff (*App.*, 137-138, 145). In addition, the only prehearing request for further documents made by any party was honored by the AEC staff (*App.*, 138 at n.2).

[12] Respondents Natural Resources Defense Council, Inc. and New England Coalition on Nuclear Pollution did not testify or participate separately. Rather they participated as constituent parts of the respondent, Consolidated National Intervenors, Inc.

[13] Testimony was presented by the United States Environmental Protection Agency, the States of New York and Minnesota, a group known as "Mapleton Intervenors", Westinghouse Electric Corporation, the Atomic Industrial Forum, a 14-member utility group, the respondents, and the technical staff of the AEC (*App.*, 136).

Staff presentation, Dr. Frank K. Pitman, Director of the AEC's Division of Waste Management and Transportation, read into the record a twenty-page statement on waste disposal and fuel reprocessing (*App.*, 25). In this statement, Dr. Pitman described the projected design parameters for a 100-year-life temporary storage facility for nuclear wastes to be utilized while ongoing studies are continued to determine the optimum method for permanent storage of such wastes (*App.*, 25-26). The conclusion of the staff experts was that the future environmental effects of the disposal of nuclear wastes were negligible (*App.*, 34).

Questioning of the participants was done by the Hearing Board (see *App.*, 136). The Board put questions on waste disposal and reprocessing to the Staff, to Dr. Pitman, and to the technical witnesses presented by respondents. Throughout the hearing the respondents insisted upon a right to cross-examination. However, at no time did the respondents attempt to show what matters they felt would be brought out by cross-examination which were incapable of presentation otherwise (*App.*, 18 at n.25, 137).

The result of the hearing and numerous posthearing filings was the promulgation on April 16, 1974 (39 Fed. Reg. 14188) by the Atomic Energy Commission of a Uranium Fuel Cycle Regulation (*App.*, 133-148) which, with minor amendments, is now codified as 10 C.F.R. § 51.20(e).

The regulation required that future Commission staff environmental impact statements prepared in connection with individual reactors include the final Table S-3 summarizing the environmental effects of the fuel cycle, and that the effects so summarized and quantified be factored as an environmental "cost" into the *Calvert Cliffs'* "cost-benefit analysis" with respect to each reactor (*App.*, 133-134, 146). The regulation also provided that no further discus-

sion of the environmental effects of the fuel cycle was required in reactor licensing proceedings, thus obviating the need for extended discussion of the environmental effects of the fuel cycle in each future reactor licensing case (*App.*, 146).

The Commission's regulation was founded upon its expert judgment as to future applications which could currently be made of existing technology (*App.*, 140). Analysis of existing technology and well established data and techniques convinced the Commission that facilities for the storage of nuclear wastes can be constructed, the use of which would have insignificant environmental effects. Recognizing, however, that the field is one of expanding technology, the Commission left open the possibility of other proceedings based upon growth in the data base.

Because the Commission found the environmental effects to be essentially insignificant, it determined that there was no reason to reopen prior cases, including *Vermont Yankee*, to restrike cost-benefit balances (*App.*, 143, 146).

D. The Decision of the Court of Appeals

In April of 1974, respondents, Natural Resources Defense Council, Inc. and New England Coalition on Nuclear Pollution, filed, in the United States Court of Appeals for the District of Columbia Circuit, a petition for review (No. 74-1385) of the Appeal Board order affirming the order of the Licensing Board which authorized the issuance of the VYNPS operating license. On July 7, 1974 respondent, Consolidated National Intervenors, Inc. filed in that same court a petition for review (No. 74-1586) of the fuel cycle rulemaking proceeding. The United States Court of Appeals for the District of Columbia Circuit had jurisdiction of these matters under the provisions of 28 U.S.C. §§ 2342,

2343. The cases were consolidated and argued together. The decision of the Court of Appeals was issued on July 21, 1976.

Relying on its prior decisions in *Scientists' Institute for Public Information (SIPI)* v. *AEC*, 481 F.2d 1079 (D.C. Cir. 1973) and *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC*, 449 F.2d 1109 (D.C. Cir. 1971), the court held (*App.*, 6-44) that the portions of the agency's rule dealing with long lived waste and fuel reprocessing were invalid. This conclusion rested on a finding by the court that the rulemaking procedures were insufficient to "ventilate" the issues and create a meaningful "dialogue." Full "ventilation" arising from a meaningful "dialogue" was held to be necessary in rulemaking proceedings held in "the NEPA context." A necessary result of the invalidation of the rule was the remand of the order granting an operating license to VYNPS.

E. Results of the Decision

After issuance of the Court of Appeals' opinion and prior to issuance of any mandate, the Nuclear Regulatory Commission, reserving its right to seek further judicial review (*App.*, 149, 151), issued on August 13, 1976 a General Policy Statement (41 Fed. Reg. 34707) setting forth the Commission's response to the decision (*App.*, 149-158). The General Policy Statement requires reopening the VYNPS operating license hearing, initially for considering whether the license should be revoked or suspended pending the rulemaking proceeding (*App.*, 155); directs the Staff to prepare a new environmental survey (*App.*, 151); and declares a moratorium upon the issuance of operating licenses or construction permits pending promulgation of an interim rule expected no earlier than December of 1976 (*App.*, 152-154).

REASONS FOR GRANTING THE WRIT

The Court of Appeals has effectively overturned the entire structure carefully established by the Nuclear Regulatory Commission for consideration of the environmental effects of nuclear waste disposal. The Commission, first by adjudication and then by rulemaking, determined the extent to which it was practical or necessary to relitigate the environmental effects of nuclear waste disposal in proceedings to license individual nuclear generating stations. The Commission also determined that more detailed consideration would be given to these environmental matters in subsequent proceedings, including consideration of individual waste disposal and reprocessing facilities. The Commission's conclusions, both in the adjudicatory and the rulemaking proceedings, are supported by evidence in the record, by the Commission's own technical expertise and broad mandate to deal with nuclear matters, and by the statutes governing the Commission's operation.

Nevertheless the Court of Appeals held that environmental effects of nuclear waste disposal must be litigated in individual generating station licensing proceedings, or, in the alternative, in a generic rulemaking proceeding which thoroughly "ventilates" the issues. The Court of Appeals further held that the rulemaking proceeding which the Commission had on the subject was procedurally — not substantively — defective because it did not provide for sufficient "ventilation" or "dialogue," even though the procedures utilized were found by the Court of Appeals to meet the minimum requirements set forth in the Administrative Procedure Act. All of these holdings are directly contrary to recent decisions of this Court and to statutory law.

I. The Court of Appeals' Decision Conflicts With Decisions of this Court as to the Proper Interpretation of the Administrative Procedure Act

The Court of Appeals found that the Commission had complied with the requirements of the Administrative Procedure Act. Nevertheless the court held that the Commission's rulemaking proceeding insufficiently "ventilated" the issues. There is, however, no basis in law for the imposition of special procedures to achieve such a goal.

The Nuclear Regulatory Commission is an agency which is not required by statute to have its rulemaking proceedings "on the record." 42 U.S.C. § 2239(a); *Siegel* v. *AEC*, 400 F.2d 778, 785 (D.C. Cir 1968). Thus the agency's generic rulemaking was governed by 5 U.S.C. § 553. *United States* v. *Florida East Coast Railway Co.*, 410 U.S. 224 (1973); *United States* v. *Allegheny-Ludlum Steel Corp.*, 406 U.S. 742 (1972). In *Allegheny-Ludlum* this Court held that 5 U.S.C. § 553 requires that:

> ". . . notice of proposed rulemaking shall be published in the Federal Register, that after notice the agency give interested persons an opportunity to participate in the rulemaking through appropriate submissions, and that after consideration of the record so made the agency shall incorporate in the rules adopted a concise general statement of their basis and purpose." 406 U.S. at 758.

This Court held that ". . . nothing more was required." *Id.*

Allegheny-Ludlum was reaffirmed in *Florida East Coast Railway, supra,* where the Court squarely held that the requirement of a "hearing" in an agency's rulemaking statute[14] does not require that more than the minimum procedures set out in 5 U.S.C. § 553 be utilized. 410 U.S. at 240-41.

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[14] The Atomic Energy Act (§ 189) does require a "hearing". 42 U.S.C. § 2239(a).

The Court of Appeals apparently acknowledged that the governing statute was 5 U.S.C. § 553 and recognized that the minimum requirements of the statute had been complied with in the rulemaking proceeding (*App.*, 16). Nevertheless, relying on a line of its own decisions (*App.*, 16 and n.23), the Court of Appeals believed that this case was one in which ". . . procedures in excess of the bare minima prescribed by the Administrative Procedure Act, 5 U.S.C. § 553, may be required" (*App.*, 16-17).[15] The Court of Appeals held that NEPA operates, in the rulemaking context, to place an additional affirmative obligation upon an agency to assure itself that all points of view are expressed in the course of the proceedings and that no duty to take any initiative lies with any party (*App.*, 21 and n.34).

NEPA, however, imposes no such additional procedural requirements. On the contrary NEPA requires only that the agency "include" a detailed environmental impact statement in any report on major Federal action. 42 U.S.C. § 4332(2)(c). It is for the agency to determine the procedural steps necessary to satisfy this obligation. *Kleppe* v. *Sierra Club*, — U.S. —, 42 USLW 5104, 5108 (June 28, 1976). Thus proceeding from erroneous legal premises, the Court of Appeals struck down an agency rule despite the fact that the procedures utilized in promulgating the rule exceeded by a wide margin the minimum required by 5 U.S.C. § 553 as interpreted by applicable decisions of this Court

[15] The basis for these additional but undefined procedural requirements is perhaps indicated by the separate statement of Chief Judge Bazelon:

> "Decisions in areas touching the environment or medicine affect the lives and health of all. These interests, like the First Amendment, have 'always had a special claim to judicial protection.' [footnote omitted] Consequently, more precision may be required than the less rigorous development of scientific facts which may attend notice and comment procedures." *App.* at 47-48.

in *Allegheny-Ludlum* and *Florida East Coast Railway, supra.*

In fact, the Court of Appeals' repeated emphasis on "ventilation" of issues and its stated requirement that the agency conduct a "dialogue" with interested parties (*e.g.*, *App.*, 17, 19, 22, 23, 40, 41 at n.59) erect a wholly unworkable (and, in many respects, unknowable) standard.[16] In this very case, the respondents have already had a full opportunity to engage in dialogue with the agency: they received notice of the agency's hearing; they appeared at the hearing; they both offered evidence and made argument. Only the respondents' requests for cross-examination and formal discovery were denied and with respect to these no offer of proof was made nor any other indication given — beyond a general statement of counsel — as to what questions the respondents wished to put. Given this record it is difficult to know what the Court of Appeals wishes the agency to do in order to stimulate dialogue.

The decision below has thus created a wholly new set of criteria, unknown to the Administrative Procedure Act or NEPA which the parties and the agency must now struggle to understand and if possible implement. At a minimum, the Court of Appeals' standard will impose further delay on an administrative process that now approaches paralysis. In the meanwhile petitioner's operating license is explicitly held hostage.

[16] In his separate statement, Judge Tamm observed (*App.*, 54) that the repeated reference to "ventilation" of issues "means very little in procedural terms". The court itself suggested that perhaps the very same procedures might suffice if administered in "a more sensitive, deliberate manner" (*App.*, 40). However, this suggestion affords little comfort since the court provided no clearer definition of "sensitivity" than it did of "ventilation."

II. The Court of Appeals' Decision Conflicts With Decisions of this Court Interpreting the National Environmental Policy Act and Also Conflicts With Successive Acts of Congress Dealing With Nuclear Energy

The decision of the Court of Appeals conflicts with the recent decision of this Court in *Kleppe* v. *Sierra Club*, — U.S. —, 42 USLW 5104 (June 28, 1976). In *Kleppe* this Court held that the identification of areas for comprehensive environmental treatment was assigned to the special competency of the appropriate agency. *Id.* at 5111. This Court stated:

> "The procedural duty imposed upon agencies by [42 U.S.C. § 4332(2)(c)] is quite precise, and the role of the courts in enforcing that duty is similarly precise. A court has no authority to depart from the statutory language [of NEPA] and, by a balancing of court-devised factors, determine a point during the germination process of a potential proposal at which an impact statement *should be prepared.*" 44 USLW at 5108 (emphasis in the original).

Here the agency exercised its special competency both through the fuel cycle rulemaking and through the reservation of more specific consideration to other separate proceedings. However, in conflict with the lesson of *Kleppe*, the Court of Appeals has held that the Commission may not confine itself to the environmental effects of the proposal before it (*i.e.*, the licensing of a single generating plant) but must consider the environmental effects of the entire fuel cycle — including separately licensed reprocessing and disposal facilities — before licensing individual generating plants.

The Court of Appeals' error is compounded by the unique history of congressional regulation and oversight in the nu-

clear field. See *Union of Concerned Scientists* v. *AEC*, 499 F.2d 1069, 1079 (D.C. Cir. 1974). The creation of long lived waste as a constituent part of the spent fuel of a nuclear reactor is a scientific certainty in the operation of any fission reactor and has been since the first reactors operated in the 1940's. The creation of long lived nuclear waste was sanctioned by Congress with the passage of the original Atomic Energy Act of 1946. It was resanctioned with the passage of the Atomic Energy Act of 1954 which first authorized civilian utilization of nuclear energy. While this statute was passed years before NEPA, many of the same concerns which prompted passage of NEPA permeate provisions of the Atomic Energy Act and the regulations promulgated thereunder. *Citizens for Safe Power* v. *NRC*, 524 F.2d 1291, 1299 (D.C. Cir. 1975). Finally, the continued creation of nuclear waste was again sanctioned by Congress with the passage of the Energy Reorganization Act of 1974, which contemplated the continued licensing and operation of nuclear reactors in the United States. The legislative history of the Energy Reorganization Act makes clear that Congress was well aware that the waste problem had not been fully resolved and that these wastes were hazardous. S. Rep. No. 93-980, 3 1974 U.S. Code Cong. Admin. News 5470, 5521; Conf. Rep. No. 93-1445, 3 1974 U.S. Code Cong. Admin. News 5538, 5547. Despite this, no moratorium on the licensing of nuclear power plants is declared or even suggested by the statute. On the contrary, the history of congressional action in the nuclear field demonstates a congressional policy that nuclear reactors should continue to be built and operated, and congressional acceptance of the fact that long lived nuclear waste was the inevitable result of such action.

Nevertheless, the decision of the Court of Appeals has jeopardized the future operation of VYNPS and other op-

erating reactors and has resulted in the suspension of future reactor licensing until the environmental effects associated with long lived wastes at separately licensed reprocessing and disposal facilities are fully "ventilated" for the benefit of, among others, the Congress. Thus the Court of Appeals has held that NEPA is to be read as working a massive change in congressional policy with respect to a matter as to which Congress, by law, has been kept fully informed (see *Power Reactor Development Co.* v. *International Union of Electrical, Radio and Machine Workers, AFL-CIO,* 367 U.S. 396, 408-09 (1961); 42 U.S.C. § 2016) and very recently has legislated (see, *e.g.,* The Energy Reorganization Act of 1974, 42 U.S.C. §§ 5842(3), 5842(4), 5843(b)(2)(B), 5844(b)(2)(B), 5844(c)). Neither NEPA, nor its legislative history, can be read as expressing a clear indication of legislative intent to make such a change in policy, see *Train* v. *Colorado PIRG,* 44 USLW 4717, 4723-24 (June 1, 1976). On the contrary, as this Court stated in *United States* v. *SCRAP,* 412 U.S. 669, 694 (1973), ". . . NEPA was not intended to repeal by implication any other statute." See also *Flint Ridge Development Co.* v. *Scenic Rivers Association of Oklahoma,* — U.S. —, 44 USLW 4954 (June 24, 1976).

III. The Decision of the Court of Appeals Improperly Disregards the Technical Judgments of the Agency and the Agency Record

The Court of Appeals' approach to the rulemaking proceeding so far departs from the accepted and usual course of judicial proceedings as to call for an exercise of this Court's power of supervision. Although disclaiming any intention to substitute its judgment for that of the agency (*App.,* 34), the court nonetheless remanded for further

proceedings because it found that the Commission had relied "uncritically" on "extremely vague assurances by agency personnel" (*App.,* 38). However, the Court of Appeals ignored evidence presented to the agency by respondents' own witnesses, gratuitously and improperly raised the question of Dr. Pitman's credibility (*App.,* 25 at n.43), and assumed contrary to the fact that no questions had been asked of Dr. Pitman (*App.,* 34 and at n.53, 41 at n.59).[17]

The court based its disagreement and rejection of Dr. Pitman's testimony in part, upon articles authored after the case was argued in the Court of Appeals (*App.,* 27 at n.46; 28 at n.47; 33 at n.51) with no opportunity for Dr. Pitman or the parties to the proceeding to respond. This is in clear conflict with the principle that "[t]he focal point for judicial review should be the administrative record already in existence, not some new record initially made in the reviewing court," *FPC* v. *Transcontinental Gas Pipe Line Corp.,* 423 U.S. 326 (1976).

The Court of Appeals simply refused to accept the judgment of the Nuclear Regulatory Commission, an expert agency created as part of ". . . a regulatory scheme which is virtually unique in the degree to which broad responsibility is reposed in the administering agency." *Siegel* v. *AEC, supra,* 400 F.2d at 783. The agency had found that an expansion of the "proposed action" before it to permit litigation of the entire fuel cycle in individual reactor licensing cases was unworkable and would lead to the complete collapse of individual licensing proceedings. The agency further found that engineering and design techniques already exist which assure that facilities can be constructed

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[17] In fact, the record reveals that a number of questions were put by the hearing board to Dr. Pitman. *Uranium Fuel Cycle,* AEC Dkt. No. RM-50-3, Transcript pp. 199-205 (Feb. 1, 1973).

which will limit fuel cycle environmental effects to the insignificant levels set out in Table S-3 (*App.*, 140, 143). There is no basis in the record or in law for the Court of Appeals' rejection of either of these judgments of this expert agency. *Kleppe* v. *Sierra Club, supra,* — U.S. at —, 44 USLW at 5110. And yet, the Court of Appeals has by its rejection of these judgments, placed in jeopardy outstanding construction permits and operating licenses, and in addition assured a delay in the issuance of any new such permits or licenses, all of this at a time when the United States, as a matter of national policy, is seeking energy independence (see 42 U.S.C. § 5801) especially in the form of reducing reliance on expensive imported oil.

CONCLUSION

The impact of the Court of Appeals' decision extends far beyond the harm to the petitioner arising from the prospect of further proceedings in a matter in litigation for over five years. It extends beyond the potential injury to the energy poor New England Region from a challenge to the continued operation of a power plant which has been operating as a significant non-oil-burning source of electrical energy in this area since 1972. The Court of Appeals' decision in fact will delay the future utilization of nuclear power in the entire United States. It has already resulted in the imposition of a moratorium on future licensing of nuclear power plants (*App.*, 152-154) at least until the erroneous standards of the Court of Appeals are satisfied.[18]

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[18] The Nuclear Regulatory Commission obviously is trying to shorten the moratorium through the device of using an "interim rule" as of December 1976 (*App.*, 152-154). However there is no guarantee that the Court of Appeals, upon the inevitable appeal, will not find the "interim rule" equally wanting especially in light of the fact that the Commission contemplates issuing it without any hearings or "dialogue". (*App.*, 154).

Nor are the harmful consequences of the Court of Appeals' decision confined to the nuclear area. If allowed to stand, the decision below will have far reaching impact on the conduct of all agency rulemaking proceedings under 5 U.S.C. § 553, and is likely to result in virtual paralysis of procedures which Congress intended to be used by an agency for expeditious resolution of issues before it.

The petition for certiorari should therefore be granted. Indeed, so clear is the error of the Court of Appeals, we believe the appropriate relief would be the summary reversal of the decision.

Respectfully submitted,

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Supreme Court, U. S.
FILED
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MICHAEL RODAK, JR., CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE
NUCLEAR POWER CORPORATION,
Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC.,
NEW ENGLAND COALITION ON NUCLEAR
POLLUTION and CONSOLIDATED NATIONAL
INTERVENORS, INC.,
Respondents

PETITIONER'S SUPPLEMENTAL BRIEF AND SUPPLEMENTAL APPENDIX

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The petitioner, Vermont Yankee Nuclear Power Corporation, files this Supplemental Brief and Supplemental Appendix pursuant to the provisions of Rule 24(5) of the Supreme Court Rules, respectfully calling the Court's attention to intervening matter not available at the time the Petition for a Writ of Certiorari was filed in this matter.

EVENTS SINCE THE FILING OF THE PETITION

The petition in this matter was filed on September 21, 1976. Since that date events have occurred, both in the Court of Appeals and in the Nuclear Regulatory Commission (the "Commission"), which emphasize the importance of the questions presented for this Court's review.

A. Action Taken By The Court of Appeals.

The Court of Appeals' opinion as originally filed referred repeatedly to the Commission hearing board's failure to question an important witness, Dr. Pittman. See Appendix to the Petition ("App.") 34 n.53, 35, 41 n.59. In fact, however, Dr. Pittman was asked a number of questions by the hearing board (see Petn. 19 n.17), and the Nuclear Regulatory Commission pointed this out to the Court of Appeals in a motion for correction. In response to this motion the Court of Appeals issued on October 8, 1976, an Order of correction. The Order simply deleted from the opinion three references to the supposed failure to question Dr. Pittman. The original opinion of the Court of Appeals appears in the Appendix to the Petition (App. 1-59); the Order of correction is reprinted in the Supplemental Appendix filed herewith (Supp. App. 1).[1]

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[1] The court failed to correct another statement implying that Dr. Pittman had not been subjected to questioning. *Compare* App. 35 *with* Supp. App. 2.

On October 8 the Court of Appeals also granted four motions for stay of mandate, including that of the petitioner, "on condition that the United States Nuclear Regulatory Commission shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein." The Court of Appeals' Order staying its mandate is reprinted in the Supplemental Appendix (Supp. App. 3).

B. Action Taken By The Nuclear Regulatory Commission.

On October 13, 1976, the Nuclear Regulatory Commission promulgated a notice of proposed rulemaking, setting out "an interim rule" for use — while proceedings with respect to a final rule were going forward — in considering the environmental impacts of fuel reprocessing and waste management. The proposed interim rule together with its statement of reasons and basis, 41 Fed. Reg. 45849 (October 18, 1976), is reprinted in the Supplemental Appendix (Supp. App. 5).

On November 5, 1976, the Commission took action in a number of individual licensing proceedings. One of these licensing proceedings involved the petitioner Vermont Yankee. In this latest *Vermont Yankee* decision the Nuclear Regulatory Commission concluded that it was free to suspend the proceedings against Vermont Yankee, which it had begun upon its own motion following the Court of Appeals' decision in the present case, and it did so. The Commission based its conclusion on a determination that the interim rule on the environmental effect of the uranium fuel cycle was not likely to be substantially different from the rule now in place and on its analysis of the Court of

Appeals' stay of mandate order. The Commission relied upon the reasoning in *Public Service Company of New Hampshire,* Nos. 50-443, 50-444, CLI-76-17, N.R.C.I.-76/11-— (Nov. 5, 1976), issued the same day. The *Vermont Yankee* and *Public Service Company of New Hampshire* decisions are reprinted in the Supplemental Appendix (Supp. App. 25, 29).

Also on November 5, 1976, the Commission promulgated a Supplemental General Statement of Policy, 41 Fed. Reg. 49898 (Nov. 11, 1976). This Statement announced that the Commission would not initiate show cause proceedings against present holders of construction permits, limited work authorizations, or operating licenses for nuclear reactors and that the Commission would suspend show cause proceedings already begun pursuant to the original General Statement of Policy. The Supplemental General Statement also expressed the Commission's conclusion that licensing could resume in individual cases whenever it could be found that use of the numerical values of the proposed interim rule would not "tilt the cost-benefit balance against the issuance of the license." The Supplemental General Statement of Policy is reprinted in the Supplemental Appendix (Supp. App. 20).

EFFECT ON THE PETITION OF INTERVENING EVENTS

The events occurring since the petition was filed in this case demonstrate the national importance and effect of the Court of Appeals' decision, and the concomitant importance of review of that decision by this Court.

I. The Court of Appeals' Opinion, as Amended, Indicates No Defect in the Agency's Record or Procedures Justifying Substitution of the Court's Judgment for That of the Agency.

The Court of Appeals has amended its opinion without any attempt to reconcile the actual facts with its previously stated rationale, thus underscoring the extent to which it disregarded the record and the technical expertise of the Nuclear Regulatory Commission and imposed mysterious procedural requirements without basis. See Petn. 13-15, 18-20. By the simple device of excising from its 44-page opinion three lines of text and ten lines of footnotes, the Court of Appeals removed the only specific procedural criticism which it made of the agency record.[2] All that remain in the Court of Appeals' opinion are statements referring to "the vagueness of the presentation" (App. 35), the agency's supposedly uncritical reliance on "extremely vague assurances by agency personnel" (App. 38), and an asserted failure to meet an undefined requirement for "ventilation" (App. 19). None of these supposed deficiencies, however, violates any procedural duty imposed upon the

[2] There are portions of the Court of Appeals' opinion in which the court appears to be criticizing the substance of the agency record, rather than its procedures. See, *e.g.*, App. 35-38. This criticism is, however, explicitly grounded upon the agency's supposed procedural failings. Thus, the Court of Appeals — in a portion of its opinion which it did not correct — states:

> "We do not dispute these conclusions [that the future environmental effects from the disposal of high-level nuclear wastes are negligible]. We may not uphold them, however, lacking a thorough explanation and a meaningful opportunity to challenge the judgments underlying them. . . . Given the opportunity, Dr. Pittman might have provided convincing answers to many of the questions which his statement leaves untouched. Since that did not occur, however, his judgments must either be accepted at face value, or rejected out of hand." App. 34-35.

Nuclear Regulatory Commission by Congress. See Petn. 13-18.

II. The Nuclear Regulatory Commission's Effort to Engage in Conditional Licensing Illustrates the Impact of the Court of Appeals' Decision on the Field of Administrative Law.

Recent developments show the turmoil which the Court of Appeals' decision will create in the field of administrative law. As matters presently stand, the adjudicatory processes of a technical and expert agency appear to be expressly conditional on subsequent judicial application of an unknown and probably unknowable standard. By its proposed interim rule (Supp. App. 5) and Supplemental General Statement of Policy (Supp. App. 20), the Nuclear Regulatory Commission is attempting to resume licensing nuclear plants in the United States — on a conditional basis. The Commission now proposes to have "continued licensing on the conditional basis the court suggests." Supp. App. 22.[3]

[3] At the same time it has suspended — but not dismissed — show cause proceedings against present licensees. Supp. App. 25-28. These new Commission positions modify its initial reaction to the Court of Appeals' decision. The Commission had issued a general statement of policy imposing a moratorium on the licensing of all nuclear plants and had subjected present holders of nuclear reactor construction permits, limited work authorizations, or operating licenses to show cause proceedings. See App. 149-58. Thereafter, on October 8, 1976, the Court of Appeals provided clarification of what it sought to achieve in the *Vermont Yankee* decision. In granting various stay motions the court stated as a condition that "the United States Nuclear Regulatory Commission shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein." Supp. App. 4.

What basis, however, did the Court of Appeals suggest? Assuming that the Court of Appeals has power to bargain with an agency in a way affecting the rights of persons not before the court, the result is to make conditional every license which will be granted by the agency and to create uncertainties (because of the still pending show cause proceedings) for present licensees, such as the petitioner, as well. The Court of Appeals specifically refused to give any advice as to what procedures, over and above those required by the Administrative Procedure Act, would satisfy it. App. 40; *see* App. 54-55 (Tamm, J. concurring). If the Court of Appeals' decision is permitted to stand, the administrative process is transformed from an effort to arrive at predictable and binding decisions in individual proceedings conducted according to understood rules, into a gamble that particular proceedings will satisfy procedural requirements the specifics of which may never be articulated.

III. The Court of Appeals Has Created in the Nuclear Industry a State of Chaos Which This Court Should End.

A reversal of the Court of Appeals' decision will remove the petitioner's license, and those of other utilities, from the state of uncertainty in which they now exist, uncertainty which has obvious ramifications in such matters as financing and power supply planning. Of at least equal importance, reversal of the decision will end the chaotic situation that exists in the area of nuclear regulation at this time.

No one presently knows if the Nuclear Regulatory Commission is on the right track as far as the Court of Appeals is concerned. The obstacles which the Commission

faces in its effort to comply with the Court of Appeals' directives are substantial. Even if the Nuclear Regulatory Commission succeeded in identifying and addressing all those contentions which the Court of Appeals would consider "major,"[4] there can be no assurance that the Commission's procedure in doing so would be satisfactory to the court. The Court of Appeals' decision creates, but does not define, new procedural requirements. Should the Commission not satisfy the Court of Appeals' requirements for "ventilation" and "dialogue," the "condition" announced by the Court of Appeals would presumably be unsatisfied and an entire industry, now supplying a significant percentage of the nation's electricity, put in jeopardy.

The Commission's proposed interim rule, Supp. App. 5, 16-18, demonstrates the extent of the problem. The agency has requested comment on its proposed interim rule as published in the Federal Register. It is clear, however, that the Commission proposes to adopt the interim rule without public hearing. On the contrary, the Commission intends to promulgate its interim rule first and to have a hearing afterward. Supp. App. 12. The gravamen of the Court of Appeals' opinion, however, was insufficient "ventilation" of the issues. Thus, while the Court of Appeals' decision stands, it must be problematical whether the interim rule, promulgated without hearing, will satisfy a court which has previously rejected as insufficiently "ventilated" a rule promulgated after an open hearing, with

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[4] This will be no easy task. For example, the Court of Appeals criticized the Commission for its failure "to address the major contentions that were raised." App. 38. Among these points which, apparently, the Court of Appeals would like to see addressed are "basic philosophical issues concerning man's ability to make commitments which will require stable social structures for unprecedented periods." App. 36.

questioning by the hearing board and an opportunity for all interested parties to present witnesses.

The nature of a nuclear power plant dictates that many millions of dollars must be invested in engineering and design prior to even submitting an application to the Commission for initial review. It is one thing to ask the members of an industry to take calculated risks that certain designs will be found acceptable. It is quite another to ask that these millions of dollars be spent in reliance on an agency's rules where the agency is engaged in a guessing game with a Court of Appeals as to what rules will be legally satisfactory. The Court of Appeals has charged the Commission to develop procedures which may or may not be found acceptable at some later date, while specifically withholding any guidance as to what procedures might be acceptable. A regulated industry is thus forced to expend large sums of money in furtherance of its obligation to supply the nation's power, without any assurance that compliance with the regulator's rules will be legally satisfactory. Such a situation is intolerable not only to the industry, but also to the ratepayers, *i.e.*, the general public, who must eventually foot the bills. Only this Court's reversal of the Court of Appeals' decision can relieve this situation.

CONCLUSION

We respectfully suggest that the events which have occurred since the filing of the petition, especially the Court of Appeals' admission that the fundamental factual premise of its decision, a failure to question Dr. Pittman, is nonextant, leads inevitably to one conclusion: the petition should be granted and the decision of the Court of Appeals summarily reversed.

Respectfully submitted,

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SUPPLEMENTAL APPENDIX

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

SEPTEMBER TERM, 1976

No. 74-1385

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.,
Petitioners

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION
AND THE UNITED STATES OF AMERICA
Respondents

VERMONT YANKEE NUCLEAR POWER CORP.,
Intervenor

No. 74-1586

NATURAL RESOURCES DEFENSE COUNCIL, INC.
AND CONSOLIDATED NATIONAL INTERVENORS,
Petitioners

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION
AND UNITED STATES OF AMERICA
Respondents

BALTIMORE GAS AND ELECTRIC CO., ET AL.
Intervenors

Before: Bazelon, Chief Judge; Edwards*, U.S. Circuit Judge for the Sixth Circuit and Tamm, Circuit Judge.

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*Sitting by designation pursuant to Title 28 U.S. Code Section 291(a).

ORDER

Upon consideration of the motion of respondents United States Nuclear Regulatory Commission and United States of America for stay of mandate and for correction of this Court's opinion dated July 21, 1976, and of petitioners' opposition thereto, and movants having called to the attention of the Court certain portions of the transcript of the hearing on February 1, 1973, which portions were omitted from the Joint Appendix, it is

ORDERED, by the Court, that respondents' motion for correction of this Court's opinion dated July 21, 1976, is granted in part, and the opinion dated July 21, 1976 is amended as follows:

On page 34, delete lines 3-5.

On page 34, delete footnote 53 and renumber all succeeding footnotes.

On page 41, delete the following from footnote 59:

"In this case the board members asked no questions whatsoever of Dr. Pittman. *See supra* note 53."

In all other respects, respondents motion for correction is denied.

Per Curiam

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

SEPTEMBER TERM, 1976

No. 74-1385

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.,
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Before: Bazelon, Chief Judge; Edwards*, U.S. Circuit Judge for the Sixth Circuit and Tamm, Circuit Judge.

*Sitting by designation pursuant to Title 28 U.S. Code Section 291(a).

ORDER

Upon consideration of the motion of respondents United States Nuclear Regulatory Commission and United States of America for stay of mandate and for correction of this Court's opinion dated July 21, 1976, of the motion of intervenor-respondent Vermont Yankee Nuclear Power Corp. for stay of mandate, of the motion of intervenor-respondents Baltimore Gas and Electric Company, et al. for stay of mandate, and of the motion of respondents for further stay of mandate, of the opposition of petitioners, and respondents' reply thereto, and of the document titled "Stipulation" which had been lodged in the Clerk's office by petitioners on August 16, 1976, it is

ORDERED, by the Court, that the Clerk is hereby directed to file the document titled "Stipulation" which had been lodged in the Clerk's Office by petitioners on August 16, 1976, and it is

FURTHER ORDERED, by the Court, that the foregoing motions for stay of mandate are granted, and the Clerk is directed not to issue the mandate herein prior to October 31, 1976, on condition that the United States Nuclear Regulatory Commission shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein.

Per Curiam

NUCLEAR REGULATORY COMMISSION
[10 CFR Part 51]

LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Uranium Fuel Cycle Impacts From Spent Fuel Reprocessing and Radioactive Waste Management

Pursuant to the National Environmental Policy Act of 1969 (NEPA), an environmental impact statement is prepared by the Commission in connection with issuance of a construction permit or operating license for each light water nuclear power reactor. These statements contain a detailed evaluation of the environmental impacts of construction and operation of the plant and a discussion of reasonable alternatives, as well as an overall assessment of the costs and benefits of the licensing action.

In November 1972, a document entitled "Environmental Survey of the Nuclear Fuel Cycle" was published by the Directorate of Licensing of the Atomic Energy Commission (AEC). The purpose of that document was to establish a technical basis for informed consideration of environmental effects of the uranium fuel cycle in the environmental impact statements for individual light water power reactors (LWR's). In the Survey the nuclear fuel cycle was treated generically. This permitted an overview of the entire industry without the need to evaluate particular plants. To compensate for the consequent lack of specific site and design detail, estimates were made of effluent concentrations, radiation dose rates, and human population densities appropriate to the model fuel-cycle facilities. This approach was necessary because it was not possible to trace the fresh and spent fuel for an individual reactor back or forward

through the fuel cycle and thereby pinpoint environmental impacts at specific plants at specific points in time.

Comments on the Environmental Survey were solicited, and an informal rulemaking hearing was held on February 1 and 2, 1973. The purpose of the hearing was to consider possible amendments of Appendix D of 10 CFR Part 50 which would, by rule, specify the environmental effects of the uranium fuel cycle to be factored into the assessment of costs and benefits in environmental impact statements for individual LWR's. Written comments were received in response to the *Federal Register* notice, and recommendations for improvement were offered during the hearings. After consideration of the written comments and the hearing record, the AEC promulgated the final fuel cycle rule (so-called Table S-3) on April 22, 1974 (39 FR 14188). It was intended that, with the inclusion of environmental impacts from Table S-3, the environmental impact statements for individual LWR's would represent a full and candid assessment of costs and benefits consistent with the legal requirements and spirit of NEPA. The AEC indicated in its decision that the rule and survey would be reexamined from time to time to accommodate new information.*

The same Table S-3 is now included in 10 CFR Part 51.

On January 19, 1975, the Atomic Energy Commission was abolished and its licensing and regulatory responsibilities transferred to the Nuclear Regulatory Commission (Commission). On July 21, 1976, the United States Court of Appeals for the District of Columbia Circuit decided

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*In this regard, the Nuclear Regulatory Commission Staff is initiating a study designed to examine information that has developed since promulgation of the fuel cycle rule in 1974 for the purpose of updating the rule in areas other than waste management and reprocessing.

Natural Resources Defense Council v. *NRC,* a case involving judicial review of the fuel-cycle rule, and *Aeschliman* v. *NRC,* a related case involving the exclusion of fuel cycle issues from an individual power reactor licensing proceeding. The Court approved the overall approach and methodology of the fuel cycle rule. It found that, "[r]egarding most phases of the fuel cycle . . . the underlying Environmental Survey represented an adequate, even admirable job, of describing the processes involved." The Court noted that the survey assembled data on consumption of resources, discussed the risks of accidents and other hazards in detail, and provided numerous references to the scholarly literature and technical reports in support of the conclusions as to environmental impact. However, the Court found that the rule was inadequately supported by the record insofar as it treated two particular aspects of the fuel cycle — the impacts from reprocessing of spent fuel and the impacts from radioactive waste management.

The Commission issued a General Statement of Policy (41 F.R. 34707, August 16, 1976) in response to the decisions. In that statement, the Commission announced its intention to reopen the rulemaking proceeding on the environmental effects of the fuel cycle to supplement the existing record on waste management and reprocessing impacts and to determine whether the rule should be amended, and, if so, in what respect. The Commission directed the Staff to prepare on an expedited basis a well-documented supplement to the survey to establish a basis for identifying environmental impacts associated with fuel reprocessing and waste management activities that are attributable to the licensing of a model lightwater reactor.

The revised survey, "Environmental Survey of the Reprocessing and Waste Management Portions of the LWR

Fuel Cycle," NUREG-0116 (Supplement 1 to WASH-1248) (hereinafter referred to as "supplement"), has now been completed and copies are available for public inspection at the Commission's Public Document Room at 1717 H St., N.W., Washington, D.C. 20555.

In the original fuel cycle rule the environmental impacts for the fuel cycle activities necessary for the support of a LWR were summarized in a Table S-3. These effects were also displayed by type of activity in Table S-3A of WASH-1248, April 1974. In the supplement, only the environmental impacts that would fall under the columns entitled "Reprocessing" (Column F) and "Waste Management" (Column G) of Table S-3A of WASH-1248 (and related transportation — part of Column H) are addressed, consistent with the Court decisions and the Commission's General Statement of Policy. The Table set forth below shows proposed revisions to Table S-3 in light of the supplement. The format of Table S-3A is followed in order to show the separate impacts from reprocessing and waste management. Both the old and new impact values are included to facilitate review. Any final interim rule will revert back to the Table S-3 format.

"Waste management," as that term was used in the fuel cycle rule and is used in this notice of proposed rulemaking, refers to the handling of wastes from post-fission operations in the fuel cycle, or other operations from which wastes arise and are shipped to some storage or burial facility. In the fuel cycle rule wastes disposed of at the sites of their generation (e.g., tailings from mills) were included in the impacts from those operations (i.e., in the other appropriate columns of Table S-3A). These wastes are mentioned in the supplement in the description of the fuel cycle, but since these aspects of the original survey were upheld by the Court, they are not addressed here.

A complete understanding of the management of nuclear wastes requires a discussion of the operations through which wastes pass from the place and time of their generation to their disposal. Therefore, the supplement discusses the operations at each plant in which the wastes are treated, stored, and prepared for shipment to offsite storage or disposal facilities. The supplement also deals with the transportation of these wastes.

In a reprocessing plant, the highly radioactive spent-fuel elements are chopped into short segments, the fuel is dissolved by strong acid, and the resultant solution is separated chemically to give (1) uranium in solution, (2) plutonium in solution, and (3) fission products and unwanted actinides in the waste stream. In this process, a number of other materials become contaminated and emerge as wastes of lesser radioactivity. All of these materials are made into a form suitable for shipment to the next step in the fuel cycle or to disposal. The impacts of all these processes are addressed in the supplement.

In the recently issued report "Final Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors," NUREG-0002, (hereafter referred to as GESMO), five alternative fuel cycle options were evaluated, and three were reviewed in detail: no recycle, uranium-only recycle, and uranium and plutonium recycle. The fuel cycle rule, Table S-3, had as its base a modification of the uranium-only recycle process in which separated plutonium was stored for possible later use, rather than being recycled or treated as a waste stream as in GESMO. This supplement considers the no-recycle fuel option in addition to the uranium-only recycle option. For the latter, plutonium is treated as a waste. The uranium-plutonium recycle option is treated in detail in GESMO

and is beyond the scope of this proceeding. The individual entries in the revised Table which follows are maximized in that they are based on the uranium-only recycle process, or no-recycle, whichever produced the greater impacts.

In the supplement the model fuel-cycle facilities, in terms of capacities, waste generation rates, and types of waste produced, are drawn from GESMO, and the environmental impacts associated with reprocessing and waste management activities are normalized to a model reactor corresponding to that in WASH-1248.

The supplement represents a full and candid discussion of spent fuel reprocessing and waste management impacts, and is based on a thorough survey of the available data. Throughout the supplement there is frequent reference to the scholarly literature and technical reports. Indeed, over 175 reports and papers were cited and reviewed. All these references are publicly available.* In addition, copies of a petition for rulemaking, submitted by the Natural Resources Defense Council on August 10, 1976, relating to procedures and approach to the assessment of the environmental impacts of reprocessing and waste management, and public comments thereon, have been made available in the Commission's Public Document Room.

In general, the supplement indicates that the available data is adequate for a quantitative assessment of impacts from normal operations of all parts of the reprocessing and waste management system. Accidents were analyzed for most components of the complete system, but the bases for these analyses in the literature were varied, and all accident sequences could not be analyzed. Sample events are analyzed for all system components, and for one part (transportation) data on accidents from normal commercial activities is quite extensive. One of the goals of GESMO was to assess the cumulative impacts of the five fuel cycle alternatives. In Chapter VIII of that document these cumulative impacts through the year 2000 were discussed and tabulated in detail, including detail in the format used in Table S-3A of WASH-1248. These adequately describe the cumulative impacts of reprocessing and waste management with regard to the present generation of light water nuclear power reactors now under review or soon to come under review for licenses.

*Those few which are not in commonly available literature have been made available in the Commission's Public Document Room.

In areas where information necessary for a complete quantitative assessment of environmental impacts is lacking (risks from sabotage, special risks from disposal of spent fuel or separated plutonium, and risks from failure in the long term of the geologic repository for high level waste) Federal programs are underway to resolve existing uncertainties.

With respect to risks from long term repository failure, representative studies have been done with varying degrees of depth and sophistication, but there are still uncertainties in areas such as the effect of waste presence on repository stability; the probabilities and consequences of various types of intrusive acts by humans; the availability of data to be used in modeling studies; the design and regulatory actions needed to minimize possibilities of repository failure; projection of future societal habits and demography, and, finally, the relative importance of the various potential initiating events. Research programs are underway which should resolve most of these uncertainties over the next few years.

Where data necessary for a complete quantitative assessment of impact is lacking, the Commission's expert judg-

ment must be brought to bear on the information available. Among the issues the Commission expects to be addressed in comments on the Supplement and this proposed interim rule and in future hearings is whether the judgments, and supporting reasons, set forth in the supplement regarding such situations are sound. Where contrary judgments are suggested, the bases for those judgments should also be provided. The supplement also includes a summary presentation of ongoing Federal programs directed at providing more complete information. While these programs are not expected to provide substantial new data for a year or more, new information that does develop through these programs or the Commission's continuing analyses in connection with this proceeding will be brought into the analysis.

The revised interim table is being proposed by the Commission as an interim substitute for the waste management and reprocessing values presently set forth in Table S-3A. After receipt and analysis of comments received in response to this notice, a final interim rule may be promulgated for use as a basis for LWR licensing. As the Commission's General Statement of Policy indicated, after promulgation of such a final interim rule, a public hearing will be held in order to facilitate effective public participation on the question whether the interim rule should be amended for future use and, if so, in what respect. The time, place, and format for the hearing will be set forth in a separate *Federal Register* notice. The interim rule would be used for LWR licensing only during the period of time required for completion of the public hearing and proceedings thereon. In order to reflect the interim character of the rule, any rule adopted will be made effective for no longer than an eighteen month period.

The Commission's present belief is that the supplemental survey can serve as an adequate foundation for such a rule.

The supplement is based on a thorough survey of the available data on waste management and reprocessing impacts, and states to the extent now possible the uncertainties and risks associated with these impacts. While the court has required an acceptable substitute for the portions of Table S-3 which it found inadequately supported as the basis for the necessary environmental impact analyses, the obvious impacts of a lengthy cessation of licensing pending final and complete analysis of the questions at issue may be considered in passing on the interim licensing question. Cf. *Union of Concerned Scientists* v. *A.E.C.*, 499 F.2d 1069 (D.C. Cir. 1974) at 1081-1086. At the Commission's direction, a separate analysis of the environmental, social and economic impacts of the use of an interim rule for licensing of LWR's has been prepared, entitled "Impacts of Later Reversing A Decision to Adopt or Not to Adopt An Interim Rule Permitting Construction or Operation of Nuclear Power Plants," October 1976. Assuming that a final rule permitting construction or operation of LWR's to proceed is adopted, this study suggests that failure to promulgate an interim rule would result in substantial increases in economic, social, and environmental costs. Substantial costs would also be incurred should construction or operation of LWR's proceed under an interim rule, and the final rule (when factored into individual impact statements) require that ongoing construction or operation cease. Such a cessation of construction or operation would, of course, only occur in this context if the present analysis of reprocessing and waste management impact proves to be dramatically in error. The Commission's present judgment is that such an outcome is unlikely.

The Commission is aware of the several comments filed with it in response to its General Statement of Policy and to the August 10 NRDC petition for rulemaking in this mat-

ter. The procedural aspects of that Statement and petition, to the extent not addressed here, will be dealt with in a notice of hearing to be published shortly. Technical aspects of the comments, including NRDC's extensive presentation and the economic data supplied by electric utility groups, have been considered in developing both the supplement and the statement of impacts. Of course, the technical judgments in both documents remain open for further comment in connection with the proposed rule.

The staff found the technical aspects of the NRDC comments, in the main, to state important elements in the area of waste management, but many were outside the scope of the present study. For instance, the staff relied on analysis of available technology (as suggested by NRDC) and dealt with some special waste types (such as spent fuel and plutonium) suggested for consideration. To the extent that some of the suggestions for inclusion were beyond present technology or are not contemplated by any of those responsible for the management of wastes, they were judged not to contribute to a reasonable projection of impacts and were not included in the survey. And, in declining to consider such matters here, the Commission does not imply any judgment regarding the appropriateness of these questions for future inquiry in other proceedings.

This Notice of Proposed Rulemaking does not address several issues identified in the General Statement of Policy. These issues include the question whether the Commission, *sua sponte,* should initiate show cause proceedings against present holders of LWR construction permits, limited work authorizations, or operating licenses; whether circumstances revealed by the supplement warrant any change in the Commission's policy regarding show cause proceedings against present licensees initiated by others; and whether licenses may be issued in pending cases, and if so under

what conditions, in advance of the adoption of an interim rule. Resolution of these questions, or some of them, may be affected by the action of the United States Court of Appeals for the District of Columbia last Friday, October 8. The court, in staying its mandate in the proceeding which led to issuance of the General Statement of Policy, indicated its view that the Commission could continue licensing activities "on condition that [the Commission] shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein." The Commission anticipates resolving these questions, in light of the supplement and the court's recent action, in the very near future. In particular, parties to existing show cause proceedings are being invited to submit views regarding the possible suspension of those show cause proceedings to the Secretary of the Commission on or before October 22, 1976.

Table 2.10

SUMMARY OF IMPACTS OF REPROCESSING AND WASTE MANAGEMENT PER RRY

(Columns F, G, and H of Table S-3A)

Natural Resource Use	F[d] Reprocessing (NUREG-0116)	F[d] Reprocessing (WASH-1248)	G[a] Waste Management (NUREG-0116)	G Waste Management (WASH-1248)	H[c] Transportation (NUREG-0116)	H Transportation (WASH-1248)	Fuel Cycle Totals[a,b] (NUREG-0116)	Fuel Cycle Totals[a,b] (WASH-1248)
Land (Acres)								
Temporarily Committed	32[h]	3.9	3.2	—	—	—	94	63
Undisturbed Area	28.5	3.7	2.9	—	—	—	73	45
Disturbed Area	3.5	0.2	0.28	—	—	—	22	18
Permanently Committed	0.12	0.03	2.6[e]	0.2	—	—	7.1	4.6
Overburden moved (millions of MT)	0.1	—	0.0015	—	—	—	2.8	2.7
Water (millions of gal.)								
Discharged to air	6.6	4.0	0.38	0.13	—	—	159	156
Discharged to water bodies	54.8	6.0	0.051	0.13	—	—	11,090	11,040
Discharged to ground	—	—	0.96	—	—	—	124	123
Total Water	61.4	10.0	1.4	0.26	—	—	11,373	11,319
Fossil Fuel								
Electrical energy (thousand MW-hr.)	4.0	0.45	0.62	.0077	—	—	321	317
Equivalent coal (thousand MT)	1.5	0.16	0.22	.003	0.016	—	117	115
Natural Gas (million scf)	28.6	—	3.3	—	—	—	124	92

[a] Maximized for either of the two cycles (U-only and no recycle).

[b] Including columns A-E of Table S-3A of WASH-1248.

[c] For wastes only.

[d] Differences between NUREG-0116 and WASH-1248 estimates of reprocessing impacts are attributable to the use of a new model plant for this Supplement.

[e] Disposal included here did not appear in WASH-1248.

[f] Not released to the environment.

[g] Major radionuclide releases in the Waste Management column are attributable to the disposal of spent fuel (no-recycle option) and the conservative assumption of complete release of gaseous nuclides in the geologic repository.

[h] The contributions to temporarily committed land are not prorated over 30 years, since the complete temporary impact accrues regardless of whether the plant services one reactor for one year or 57 reactors for 30 years.

Table 2.10 (Continued)

Natural Resource Use	F[d] Reprocessing (NUREG-0116)	F[d] Reprocessing (WASH-1248)	G[a] Waste Management (NUREG-0116)	G Waste Management (WASH-1248)	H[c] Transportation (NUREG-0116)	H Transportation (WASH-1248)	Fuel Cycle Totals[b] (NUREG-0116)	Fuel Cycle Totals[b] (WASH-1248)
Effluents								
Chemical (MT)								
Gases (MT)								
SO x	5.4	6.2	0.030	—	0.045	—	4,400	4,400
NO x	21.9	7.1	0.031	—	0.62	2.6	1,190	1,177
Hydrocarbons	0.5	0.02	0.02	—	0.062	—	14	13.5
CO	0.5	0.04	0.007	—	0.38	—	29.6	28.7
Particulates	0.6	1.6	0.02	—	0.022	—	1,154	1,156
Other Gases								
F^-	0.05	0.11	—	—	—	—	0.67	0.72
HCl	6E−4	—	0.013	—	—	—	0.14	—
Liquids								
$SO_4^=$	<0.02	0.4	—	—	—	—	9.9	10.3
NO_3^-	—	0.9	—	—	—	—	25.8	26.7
Fluoride	—	—	—	—	—	—	12.9	12.9
Ca^{++}	—	—	—	—	—	—	5.4	5.4
Cl^-	0.09	0.2	—	—	—	—	8.5	8.6
Na^+	<0.02	5.3	—	—	—	—	12.1	16.9
NH_3	—	—	—	—	—	—	10.0	11.5
Tailings Solutions (thousands)	—	—	—	—	—	—	240	240
Fe	—	—	—	—	—	—	0.4	0.4
Solids	—	—	0.42	—	—	—	91,000	91,000

Table 2.10 (Continued)

Natural Resource Use	Fd Reprocessing (NUREG-0116)	Fd Reprocessing (WASH-1248)	Ge Waste Management (NUREG-0116)	G Waste Management (WASH-1248)	Hc Transportation (NUREG-0116)	H Transportation (WASH-1248)	Fuel Cycle Totalsb (NUREG-0116)	Fuel Cycle Totalsb (WASH-1248)
Effluents (Cont'd)								
Radiological (curies)								
Gases (including entrainment)								
Rn-222	—	—	0.0071	—	—	—	74.5	74.5
Ra-226	—	—	5.3E−7	—	—	—	0.02	0.02
Th-230	—	—	5.3E−7	—	—	—	0.02	0.02
Uranium	0.000039	—	7.9E−6	—	—	—	0.034	0.032
Tritium (thousands)	18.1	16.7	14g	—	—	—	18.1	16.7
Kr-85 (thousands)	400	350	290g	—	—	—	400	350
I-129	0.03	0.0024	1.3g	—	—	—	1.3	0.0024
I-131	0.83	0.024	—	—	—	—	0.83	0.024
Fission Products	0.18	1.0	0.003	—	—	—	0.021	1.0
Transuranics	0.023	0.004	0.0014	—	—	—	0.024	0.004
C-14	24	—	19g	—	—	—	24	—
Liquids								
Uranium & Daughters	—	—	5.4E−6	—	—	—	2.1	2.1
Fission & Activation Products	—	—	5.9E−6	—	—	—	5.9E−6	—
Ra-226	—	—	—	—	—	—	0.0034	0.0034
Th-230	—	—	—	—	—	—	0.0015	0.0015
Th-234	—	—	—	—	—	—	0.01	0.01
Tritium (thousands)	—	2.5	—	—	—	—	—	2.5
Ru-106	—	0.15	—	—	—	—	—	0.15
Solids (buried onsite)f								
Other than high level (shallow)	0.52	—	4,700	—	—	—	5,300	601
TRU & HLW (deep)	—	—	1.1E+7	—	—	—	1.1E+7	—
Thermal (billions of Btu)	75.5	61	88	1.0	0.014	0.03	3,462	3,360

Accordingly, pursuant to the Atomic Energy Act of 1954, as amended, NEPA, the Energy Reorganization Act of 1974, as amended, and sections 552 and 553 of Title 5 of the United States Code, notice is hereby given that adoption of the substance of the following Table is contemplated as a revision to Table S-3 of 10 CFR Part 51. All interested persons who desire to submit written comments or suggestions for consideration in connection with the proposed amendments, or to submit comments on the underlying supplement to Wash-1248 or impact analysis, should send them to the Secretary of the Commission, U. S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Section, by (45 days after publication in the FR). Copies of the supplement and impact analysis may be examined at the Commission's Public Document Room at 1717 H Street, Washington, D. C. and at the Commission's local Public Document Rooms. Copies of the comments received in response to this notice will be placed in the Commission's Public Document Room in Washington, as received. Single copies of the supplement and impact analysis may be obtained without charge, to the extent of supply, by writing to the Division of Document Control, U. S. Nuclear Regulatory Commission, Washington, D.C. 20555. (Sec. 161, Pub. Law. 83-703, as amended, 68 Stat. 948, as amended [42 U.S.C. 2201]; Sec. 102, Pub. Law. 91-190, 83 Stat. 853 [42 U.S.C. 4332], Sec. 201, Pub. Law. 93-438, as amended, 88 Stat. 1242, 89 Stat. 415, [42 U.S.C. 5841]).

FOR THE
NUCLEAR REGULATORY COMMISSION

SAMUEL J. CHILK
Secretary of the Commission

Dated at Washington, D.C.
this 13th day of October, 1976.

U. S. NUCLEAR REGULATORY COMMISSION

[Docket RM-50-3]

ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE

Supplemental General Statement of Policy

In a notice of proposed rule making dated October 13, 1976 and published in the FEDERAL REGISTER on October 18, 1976 (41 F.R. 45849) entitled "Uranium Fuel Cycle Impacts from Spent Fuel Reprocessing and Radioactive Waste Management", the Commission solicited comments on a proposed revision to Table S-3 of 10 CFR Part 51 and a related survey ("Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle" NUREG-0116-Supplement 1 to WASH-1248) and impact analysis ("Impacts of Later Reversing a Decision to Adopt or Not to Adopt an Interim Rule Permitting Construction or Operation of Nuclear Power Plants", October 1976). The October 13, 1976 notice of proposed rule making was an action forecast by a General Statement of Policy which the Commission issued (41 F.R. 34707, August 16, 1976) in response to two recent decisions (July 21, 1976) by the United States Court of Appeals for the District of Columbia Circuit (*Natural Resources Defense Council* v. *NRC* and *Aeschliman* v. *NRC*).

While the October 13, 1976 notice addressed a number of issues raised in the General Statement of Policy, certain questions were explicitly deferred with the notation that the Commission anticipated resolving these questions in the very near future. The deferred questions were whether the Commission, *sua sponte,* should initiate show cause proceedings against present holders of construction permits, limited work authorizations, or operating licenses for light water reactors; whether circumstances revealed by the supplement warrant any change in the Commission's policy regarding show cause proceedings against present licensees initiated by others; and whether licenses may be issued in pending cases, and if so under what conditions, in advance of the adoption of an interim rule. This Supplemental Statement of Policy addresses two of those questions.

Two factors appear to the Commission to bear decisively on each of these questions. First, the United States Court of Appeals for the District of Columbia Circuit on October 8, 1976 has stayed its mandate in the proceedings which gave rise to the issuance of the General Statement of Policy. In staying its mandate the court indicated that the Commission could continue licensing activities "on condition that (the Commission) shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein." Second, the breadth and quality of the present analysis of reprocessing and waste management impacts set forth in the supplemental survey lead the Commission to believe it improbable that the assessment that such impacts are slight will prove to be dramatically in error.

In light of the stay of the court's mandate, the quality of the present analysis of reprocessing and waste management impacts set forth in the supplemental survey, and the relatively short period of time anticipated before the interim rule can be adopted,* the Commission presently perceives no compelling reason, on either legal or policy grounds, for initiating *sua sponte* show cause proceedings against present holders of light water reactor construction permits, limited work authorizations, or operating licenses. Rather, the Commission's present belief is that it would not be justified in instituting new proceedings against the holders

*The Commission believes that a decision whether to adopt an interim rule can be made during January 1977.

of such permits, authorizations and licenses on Table S-3 grounds pending the outcome of the current rulemaking. With respect to show cause-type proceedings initiated by others pursuant to the August 16, 1976 General Statement of Policy, which are presently under way, the Memoranda and Orders we are issuing today in those proceedings have the effect of suspending them pending anticipated adoption of an interim rule.

On the question of issuing licenses in pending cases, five principal considerations are relevant and manifest. First, it would be inappropriate for the Commission to continue to license facilities on the basis of the existing reprocessing and waste storage values of Table S-3 without taking account of the improved and expanded analysis now at hand. Second, that improved and expanded analysis is not now reflected in any currently applicable Commission rule. Third, while continued licensing solely on the basis of the present Table S-3 values for reprocessing and waste management would be inappropriate, it is now clear that the court envisions further licensing; and the information now available to the Commission indicates that a halt in licensing activity is more likely to have a severe social and environmental impact than continued licensing on the conditional basis the court suggests, taking some account of the newly developed analysis. Fourth, there is no bar to the use of the revised chemical reprocessing and waste storage values of the S-3 Table in pending proceedings — prior to the adoption of an interim rule — on the basis of individual NEPA analyses of reprocessing and waste management impacts. In connection with this last consideration, however, there is the significant practical constraint raised by the needless duplication which proceeding both by rulemaking and in individual licensing hearings would entail and the overall delay that would result. The Commission is sharply aware of the advantages of avoiding such duplication and attendant strain on the resources of parties by

focusing resolution of issues which may be raised regarding the survey in a single proceeding. Finally, the Commission anticipates that the interim rule as promulgated will closely resemble the proposed rule published on October 13, and like that proposed rule, will not produce results significantly different from those obtained under the current rule.

With these considerations in mind, the Commission has concluded that licensing may resume on a conditional basis using the existing Table S-3 if, but only if, the revised values are examined to determine whether, if those values were used, the result would tilt the cost-benefit balance against the issuance of the license. Under this approach, the accuracy of the revised values will not be an issue in the licensing proceeding. While this approach may leave the validity of licenses in some doubt, it has the advantage of lessening duplication of the resources of the parties to the proceedings. Most importantly it responds to the suggestion in the court's order of October 8, 1976 that continued licensing under the existing rule on a conditional basis would be appropriate, without ignoring the newly developed values. The additional analysis called for may also avoid the need for further proceedings on these licenses, should rulemaking eventuate in adoption of these or comparable values.

In sum, the Commission has concluded that subject to the limitations hereinafter expressed, full-power operating licenses, construction permits and limited work authorizations may be issued in pending cases in advance of the adoption of an interim rule on the basis of the currently effective chemical reprocessing and waste storage values of Table S-3. The Commission directs that such licenses may be issued only if further, specific analysis is performed to determine whether, if the revised chemical reprocessing and waste storage values set forth in the Commission's notice of

proposed rulemaking of October 18, 1976 were used, the result would tilt the cost-benefit balance against the issuance of the license. If it appears that the balance would be so tilted, then the proceeding will be suspended, with respect to chemical reprocessing and waste storage issues, pending further action by the Commission. Under this approach the accuracy of the revised values is not to be an issue in the proceeding, but the determination whether the cost-benefit balance would be tilted, if the revised values were used, is fully at issue in the proceeding. Further, any full-power operation license, construction permit or limited work authorization issued under this approach must be conditioned in accordance with the court's order (staying its mandate) dated October 8, 1976.

To the extent that this Supplemental General Statement of Policy differs from the Commission's General Statement of Policy of August 16, 1976, the latter is modified accordingly.*

FOR THE
NUCLEAR REGULATORY COMMISSION

SAMUEL J. CHILK
Secretary of the Commission

Dated at Washington, D.C.
this 5th day of November, 1976

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*In seeking a stay of mandate from the court of appeals, the Commission informed the court of its General Statement of Policy and the intention there stated to make further licensing actions depend on the basis of a further request to the court, to be made within a few weeks of issuance of the revised survey. In the Commission's view, the specific reference to continued licensing in the court's order moots this proposed action. The Commission also notes that the court granted all petitions for stay, not merely its own; the other petitions filed were not conditioned as was the Commission's.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

EDWARD A. MASON, *Acting Chairman*
VICTOR GILINSKY
RICHARD T. KENNEDY

IN THE MATTER OF

VERMONT YANKEE NUCLEAR POWER CORPORATION (Vermont Yankee Nuclear Power Station)	Docket No. 50-271
PUBLIC SERVICE ELECTRIC & GAS COMPANY (Salem Nuclear Generating Station, Units 1 & 2)	Docket Nos. 50-272 50-311
PHILADELPHIA ELECTRIC COMPANY (Peach Bottom Atomic Power Station, Units 2 & 3)	Docket Nos. 50-277 50-278
METROPOLITAN EDISON COMPANY, ET AL. (Three Mile Island Nuclear Station, Units 1 & 2)	Docket Nos. 50-289 50-320
DUQUESNE LIGHT COMPANY, ET AL. (Beaver Valley Power Station, Units 1 & 2)	Docket Nos. 50-334 50-412
PHILADELPHIA ELECTRIC COMPANY (Limerick Generating Station, Units 1 & 2)	Docket Nos. 50-352 50-353
PUBLIC SERVICE ELECTRIC AND GAS COMPANY AND ATLANTIC CITY ELECTRIC COMPANY (Hope Creek Generating Station, Units 1 & 2)	Docket Nos. 50-354 50-355
PENNSYLVANIA POWER AND LIGHT COMPANY (Susquehanna Steam Electric Station, Units 1 & 2)	Docket Nos. 50-387 50-386
UNION ELECTRIC COMPANY (Callaway Plant, Units 1 & 2)	Docket Nos. STN-50-438 STN-50-486

MEMORANDUM AND ORDER

On September 27, 1976, Vermont Yankee Nuclear Power Corporation submitted a document entitled "Motion of Licensee for Recall of Orders in Light of Changed Circumstances". Although the caption of that document indicated

that it was only filed in the proceeding directly involving the Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station), Docket No. 50-271, the requested relief would apply to all of the proceedings listed above.[1] Since that was so and in view of events occurring subsequent to Vermont Yankee's motion, on October 13, 1976, we asked all parties to those proceedings to respond to Vermont Yankee's motion for "the suspension of all pending show cause proceedings on fuel cycle grounds".

The questions raised by Vermont Yankee's motion form a part of the complex set of issues presented to this Commission by the decision in *Natural Resources Defense Council* v. *U. S. Nuclear Regulatory Commission,* F.2d , Nos. 74-1385, 74-1586 (D.C. Cir. July 21, 1976) (the "fuel cycle decision"). Many of those issues and the Commission's response to them are detailed in our Memorandum and Order issued today in *Public Service Company of New Hampshire, et al.* (Seabrook Station, Units 1 and 2). Therein we explain our reasons for suspending the proceedings seeking suspension of the Seabrook construction permit on fuel cycle grounds. That decision is founded upon our judgment that an interim rule on the environmental effect of the uranium fuel cycle is not likely to be substantially different from the rule now in place, and would be in place in about three months. In such circumstances, suspension of the Seabrook Construction permit

[1] Formally, Vermont Yankee did not make motions in these proceedings but moved the Commission to recall as much of its General Statement of Policy, 41 *Fed. Reg.* 34707 (August 16, 1976) as authorized any subordinate element of the Commission to reconsider a permit or license on fuel cycle grounds. As a matter of procedure, we note that Vermont Yankee, which is not a party to any proceeding other than its own, normally could not make any motion in a proceeding to which it is not a party. However, in view of the conclusions we reach, we can suspend further proceedings in the other cases on our own motion.

pending review by the Appeal Board appeared unwarranted. Since our Seabrook decision was not based on the specific facts of the Seabrook situation but depended upon our generic assessment of the issues involved, it is equally applicable to each of the above-styled proceedings.

Accordingly we find suspension proceedings unwarranted in these cases, in many of which licenses have issued following final agency action, and in which the cost/benefit balance as already struck favors the reactor. There is not a sufficient likelihood that the balance would be tipped to warrant the substantial costs that would be imposed by suspending construction or operation for the brief period that appears necessary to resolve these issues.

Our conclusion in Seabrook is also based on our analysis of the stay of mandate of the fuel cycle decision. In the Commission's motion for a stay of mandate it indicated that it would use the General Statement of Policy as a basis for implementing the fuel cycle decision subject to possible changed procedures in light of the revised survey, and to the possibility that it might seek a further stay of mandate based on the results of the survey. *See, Seabrook,* slip opinion at 22-23 and n.11. It also indicated to the court that suspension proceedings in Vermont Yankee had been undertaken. The stay motions of Vermont Yankee and the intervenor utilities, however, were based on entirely different considerations and sought specifically to prevent shutdown of the Vermont Yankee facility and to halt all suspension proceedings based on fuel cycle grounds. *Seabrook,* slip opinion at 23-24. As explained more fully in the Seabrook opinion, we believe that the October 8 order granting their motions introduces new circumstances of which the Commission must take account; it frees us of any constraint which may have been introduced by our representation that suspension proceedings had been undertaken

for the Vermont Yankee facility. As we discuss in the Seabrook opinion at pp. 24-28, we believe that the most logical interpretation of the effect of the stay of mandate is that it postpones any mandatory effect of the fuel cycle decision, subject to a condition of any new licenses, until the possibility of a successful appeal has been resolved. The Commission remains free, if later-developed facts so warrant, to suspend licenses or take any other action required in the exercise of its ordinary regulatory authority.[2] Consequently, we do not believe that the fuel cycle decision or the stay of the mandate in that decision disables us from suspending these show cause proceedings.

For the reasons stated above, the pending proceedings in these cases are suspended.[3]

It is so ORDERED.

By the Commission.

SAMUEL J. CHILK
Secretary of the Commission

Dated at Washington, D.C.
this 5th day of November 1976.

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[2] Admittedly, the meaning of the court's order is subject to different interpretations. We are transmiting a copy of this decision setting forth our assessment of the meaning of the order to the court for its information.

[3] This Memorandum and Order does not apply to the reopened proceeding involving Consumers Power Company (Midland Plant, Units 1 and 2), Docket Nos. 50-329, 50-330, which is dealt with in a separate order. We note that ALAB-352, the Appeal Board decision in the Union Electric Company (Callaway Plant, Units 1 and 2), Docket Nos. STN 50-483, STN 50-486 proceeding, is presently within the twenty-day review period prescribed by 10 CFR § 2.786(a). Without intimating any opinion on the merits of the issues decided in ALAB-352, we believe that proceeding should also be suspended.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

MARCUS A. ROWDEN, *Chairman*
EDWARD A. MASON
VICTOR GILINSKY
RICHARD T. KENNEDY

IN THE MATTER OF PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, ET. AL. (Seabrook Station, Units 1 and 2)	DOCKET NOS. 50-443 50-444

Appearances

Thomas G. Dignan, Jr. and *John A. Ritsher,* for the Applicant, Public Service Company of New Hampshire

Martin G. Malsch and *Michael Grainey,* for the Regulatory Staff

Anthony Z. Roisman and *David Fleischaker,* for the Intervenor, New England Coalition on Nuclear Pollution

Ellyn R. Weiss, for the Commonwealth of Massachusetts

MEMORANDUM AND ORDER

Introduction and Summary

On September 30, 1976, the Atomic Safety and Licensing Appeal Board, by a divided vote, granted a motion by the intervenor New England Coalition on Nuclear Pollution to suspend the effectiveness of the outstanding construction permits in this proceeding on the basis of the Commission's

General Statement of Policy of August 13, 1976, concerning the environmental effects of the uranium fuel cycle. 41 Fed. Reg. 34707. On October 5, 1976, we decided to review ALAB-349, called for briefs from the parties, and set the matter for oral argument.[1] The effect of our order was to stay the Appeal Board's action. 10 CFR 2.786(a). In taking review we indicated a special interest in the impact of a forthcoming staff study called for in the General Statement of Policy. Thereafter, we asked the parties to address at oral argument several additional developments bearing on whether we should modify the Appeal Board's decision. For the reasons set forth hereafter, we hold that, in the light of these developments, this proceeding is suspended and construction of the Seabrook facility may be allowed to continue, pending anticipated adoption of an interim rule concerning the environmental effects of the fuel cycle and also subject to the outcome of two other proceedings — the appeals pending before the Appeal Board on the merits of the initial decision authorizing their issuance, and the Appeal Board's pending reconsideration of an application for a stay pending appeal.

[1] On October 13, 1976, counsel for the intervenor NECNP wrote a letter to the Commission's General Counsel stating that he wished information "with respect to the meeting on Saturday, October 2, 1976, between members of the Commission and representatives of the Public Service Company of New Hampshire." The Commission's General Counsel brought the inquiry to the personal attention of each Commissioner individually, and each responded that he had participated in no such meeting. The General Counsel communicated these responses to counsel for NECNP who declined to provide any further information. The Commission subsequently met to discuss the matter and unanimously agreed that, in light of the obvious inappropriateness of such a meeting at that time, any Commissioner who had taken part in such a meeting would be disqualified from further proceedings in this case. At the beginning of the oral argument on October 26, 1976, these developments were summarized by the Chairman and counsel for NECNP was asked whether he wished to provide any further information or say anything else regarding the alleged meeting. The Chairman stated that the matter "must be laid to rest, and laid to rest on the record of this proceeding." Counsel for NECNP replied that "I have nothing additional to add to what I have already said." Tr. pp. 5-7. Correspondence relating to this matter was read into the record. Tr. pp. 7-10. No such meeting occurred.

As suggested by our opening paragraph, the background and procedural history of this matter are quite complex. Various aspects of that history have been set forth in the initial decision of the Atomic Safety and Licensing Board authorizing issuance of the construction permits (NRCI-76/6 857), the Appeal Board's decision in ALAB-338 denying an application for stay pending appeal (NRCI 76/7 10), and the Appeal Board's decision presently under review, ALAB-349 (NRCI 76/9__). It is unnecessary to review all of that history here. Rather, we will summarize the facts relevant to the basic issue presented — whether the Seabrook construction permits should be suspended pending adoption of an interim rule governing assessment of the incremental environmental impacts of the uranium fuel

We recognize that there are strongly held and conflicting views on many of the issues that fall within our mandate. For that reason, all participants in our proceedings should seek to promote the process of rational decisionmaking. We feel constrained in this context to take note of objectionable portions of the reply submission of counsel for NECNP in this proceeding. For example, counsel for NECNP tells us that "Each Commissioner must ask himself to what master he is loyal. There is no integrity in loyalty to a false master as Messrs. Haldeman, Erhlichman, Mitchell, et al., learned so well." He further states that "Some day, some time, each Commissioner must face up to the reality that he has sworn on oath to regulate nuclear power. Today is that day." NECNP Response to Briefs of Applicants and NRC Staff, p. 4. In our judgment, innuendos of this kind cross the line between vigorous advocacy and impropriety.

cycle attributable to an individual light water reactor, like Seabrook, in the NEPA cost/benefit analysis for such a reactor.

Factual and Procedural Background

The applicant Public Service Company of New Hampshire proposes to build a two-unit nuclear electric generating station in the vicinity of Seabrook, New Hampshire. Following a contested licensing proceeding, in which the environmental impacts associated with the uranium fuel cycle were duly factored into the NEPA cost/benefit analysis for the reactor in accordance with 10 CFR 51.20(e), a divided Atomic Safety and Licensing Board authorized issuance of construction permits on June 29, 1976. On July 7, 1976, construction permits were issued by the Director of Nuclear Reactor Regulation. Construction commenced shortly thereafter and has been proceeding since that time. Appeals are presently pending on the merits of the Licensing Board decision before the Atomic Safety and Licensing Appeal Board, including a challenge to that aspect of the Commission's rule governing the assessment of waste disposal impacts associated with the fuel cycle. Brief discussion of the background of that rule is necessary to put this matter in perspective.

Prior to 1974, the incremental environmental impacts associated with the uranium fuel cycle were not factored into cost/benefit analyses, for individual light water reactors. Such impacts were deemed to be too indirect and remote for consideration in the context of licensing an individual reactor, and properly postponed for consideration in conjunction with the planned licensing of waste management and reprocessing facilities. See *Vermont Yankee Nuclear Power Corp.*, 4 AEC 930 (1972). In April 1974, the AEC

concluded a rulemaking proceeding resulting in the adoption of a table of numerical values which quantify the environmental impacts of the uranium fuel cycle attributable to an individual reactor. This table, denominated Table S-3, is now incorporated in our rules implementing NEPA. 10 CFR 51.20(e), 51.23(a). As reflected in the statement of considerations adopting the present rule, these environmental impacts were found to be very small. 39 Fed. Reg. 14188-91. The rules accordingly provided that the table's numerical values were to be included in applicant's environmental reports and in staff environmental impact statements for individual reactors, but that no further discussion of fuel cycle impacts was to be required. The validity of the new rule was challenged, both in the context of individual reactor licensings, and by an appeal from the AEC's adoption of the rule itself.

On July 21, 1976, two weeks after the construction permits were issued in this case, the United States Court of Appeals for the District of Columbia Circuit rendered its decision on these challenges in *Natural Resources Defense Council* v. *NRC,* Nos. 74-1385 and 74-1586 (hereafter referred to as the "fuel cycle decision"). The court found that, regarding most phases of the uranium fuel cycle, Table S-3 rested on an "adequate, even admirable" basis. Slip opinion at 24. However, the court held that the rule embodying Table S-3 was inadequately supported by the rulemaking record insofar as it treated the effects of reprocessing of spent fuel and radioactive waste. The court further held that NEPA requires analysis of such reprocessing and waste issues, either through rulemaking or in individual licensing proceedings, as a prerequisite to Commission licensing of a nuclear power plant. A majority of the court also indicated that, should the Commission choose to revise its rule, it should do so by procedures more demand-

ing than the notice-and-comment procedures normally required for informal rulemaking by the Administrative Procedure Act.

On August 13, 1976, the Commission issued a General Statement of Policy in response to the court's decision, entitled "Environmental Effects of the Uranium Fuel Cycle." The General Statement of Policy was intended to spell out the Commission's reading of the court decision, to indicate its intended courses of action by way of implementation and possible appeal of the decision, and to provide guidance to licensing and appeal boards and to the regulatory staff during the implementation period. Among other things, the Commission directed the regulatory staff to "review the existing literature thoroughly and to produce on an expedited basis a revised and adequately documented environmental survey on the probable contribution to the environmental costs of licensing a nuclear power reactor that is attributable to the reprocessing and waste management stages of the uranium fuel cycle." The Commission expressed its intention to reopen the rulemaking proceeding on the environmental effects of the uranium fuel cycle for the limited purposes of (1) supplementing the record of the reprocessing and waste management issues; and (2) determining whether or not, on the basis of the supplemented record, Table S-3 should be amended. In addition, the staff was directed to prepare an evaluation of the environmental impact of using a possible interim rule as a basis for licensing until a final rule is in place, and an assessment of the impact of a suspension of further licensing during that time period.

The Commission stated its expectation that, on the basis of notice-and-comment procedures, an interim rule might be promulgated as early as December 1976, providing a basis for further licensing at that time. In the interim,

however, the Commission concluded that "no new full-power operating license, construction permit or limited work authorization should be issued." That conclusion was "based on recognition that the grant of each of those authorizations, permits or licenses is premised upon the completion of an adequate environmental impact statement, and that under the court's decision, absent an acceptable substitute for those portions of Table S-3 which the court had found inadequately supported, the basis for a complete environmental impact statement will not be in place." Thus, the Commission made a generic determination that new operating licenses and construction permits, with limited exceptions, could not issue pending adoption of an interim rule or some other resolution of the issues raised by the court's opinion.

The Commission's General Statement of Policy took a different approach with respect to already-issued and outstanding operating licenses and construction permits applicable to operating reactors and to situations, like Seabrook, where construction was already underway. With regard to such licenses and permits, the Commission adopted a case-by-case approach, saying that:

> questions of modification or suspension should be resolved in formal proceedings in light of the facts and the applicable law. Since we have decided that reprocessing and waste management issues should be treated generically by rulemaking rather than on a case-by-case basis, the initial question on remand of the *Vermont Yankee* and *Midland* orders [cases involving an outstanding operating license and construction permit, respectively] will be whether the licenses should be continued, modified, or suspended until an interim rule has been made effective. In resolving this question, the Commission intends to assign the matter to licensing boards with instructions to call for briefs from the parties followed by evidentiary hearings if necessary. The same question would arise

on a request for a show cause order seeking the suspension or modification on fuel cycle rule grounds of any other nuclear power plant license.

It is the Commission's understanding that resolution of this question turns on equitable factors well established in prior practice and case law. Such factors include whether it is likely that significant adverse impact will occur until a new interim fuel cycle rule is in place; whether reasonable alternatives will be foreclosed by continued construction or operation; the effect of delay; and the possibility that the cost/benefit balance will be tilted through increased investment.

On August 18, 1976, the intervenor NECNP filed the subject motion before the Appeal Board seeking suspension of the Seabrook construction permits on the basis of the General Statement of Policy. Following briefing and oral argument, a divided Appeal Board rendered ALAB-349 on September 30, 1976, granting the NECNP motion and ordering suspension of the Seabrook construction permits, but staying the effect of its decision for eight days to maintain the *status quo* until the Commission had an opportunity to decide whether to review the matter. The majority determined that under the particular facts and circumstances of that case, and applying its understanding of the factors specified in the Commission's General Statement of Policy, a cessation of construction was warranted pending further resolution of the fuel cycle issues raised by the court of appeals decision. The majority stressed both its conclusion that the increased investment that would take place before adoption of an interim rule might "tilt" a subsequent NEPA cost/benefit balance toward continued construction of Seabrook, and its inability either to fix a limit on the time adoption of an interim rule might take or to guess at the nature of any rule that might be adopted.

The dissenting member of the Board reasoned, first, that it was reasonable to expect that an interim rule would be

in place in a six-month period. Adoption of that timing frame of reference altered his view of the environmental impacts to be anticipated by denial of the suspension motion and also the costs that the applicant was likely to incur during that period. As a result of that analysis, he concluded that application of the factors listed in the General Statement of Policy to the record in this case could not justify suspension of the Seabrook permits.

On October 5, 1976, we decided to review the Appeal Board's ALAB-349 decision. Knowing that the revised fuel cycle survey would be publicly available shortly and that it might well have a bearing on our disposition of ALAB-349, we asked the parties to address its relevance in their submissions. In order to preserve the status quo and as contemplated by 10 CFR 2.786(a), we continued in effect the Appeal Board's temporary stay of its decision. Recognizing the need for expeditious treatment, however, we set an expedited briefing schedule and committed ourselves to a prompt decision following oral argument.[2]

On October 8, 1976, the Court of Appeals for the District of Columbia Circuit granted three pending stay motions filed with reference to its fuel cycle decision. The stay of mandate was granted on the condition that the Commission would "make any licenses granted between July 21, 1976

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[2] Intervenor NECNP sought summary reversal in the Court of Appeals for the First Circuit of our October 5 order, alleging, among other things, that we had violated 10 CFR 2.786 in not announcing reasons for our decision to review. As we recently stated in *United States Energy Research and Development Administration* (Clinch River Breeder Reactor Plant), NRCI 76/8 67, 75, the rule does not require any statement of reasons in an order merely announcing a decision to undertake review. Obviously this is an important case of first impression and therefore an appropriate case for Commission review. NECNP's motion for summary reversal is pending before the First Circuit, styled *New England Coalition on Nuclear Pollution* v. *NRC*, No. 76-1469.

[the date of the decision] and such time when the mandate is issued subject to the outcome of the proceedings herein." The court's mandate will not issue before the Supreme Court acts on pending petitions for certiorari and, if certiorari is granted, the decision invalidating portions of Table S-3 may be reversed.

Also on October 8, 1976, the Court of Appeals for the First Circuit, in which an application for a stay of the Seabrook construction permits pending appeal is pending invited our Appeal Board to reconsider an application to it for a stay based largely upon alleged environmental impacts to be anticipated from continued construction of Seabrook. The Appeal Board is presently entertaining a motion for reconsideration addressed to these matters.

On October 13, 1976, the revised fuel cycle survey, entitled "Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0116, was made available for public comment. At the same time, the Commission issued a notice of proposed rulemaking, proposing for adoption a revised table as an interim substitute for the waste management and reprocessing values presently set forth in Table S-3. We expressed our present belief that the revised survey can "serve as an adequate foundation" for an interim rule and our judgment that the survey's analysis of reprocessing and waste management impacts would not prove to be "dramatically in error." We believe that an effective interim rule can be in place in January 1977.

There was then pending before the Commission a motion by the Vermont Yankee Corporation seeking recall of the Commission's directive, in its General Statement of Policy, establishing a hearing board to consider suspension of the Vermont Yankee license and authorizing the convening of similar boards on petition in other cases, until such time as

the mandate might issue. By memorandum of October 13, 1976, from the Secretary, the parties in all pending suspension proceedings, including this proceeding, were referred to these developments and informed that—

> In light of all these circumstances, and in particular the court of appeals' action and the indications that adoption of an interim rule on a timely basis will be feasible, the Commission is considering the suspension of all pending show cause proceedings on fuel cycle issues, as moved by the Vermont Yankee Corporation.

Responses to the Vermont Yankee motion were solicited and several such responses were received.

These developments were called to the attention of the parties in this proceeding by a memorandum from the Secretary on October 20, 1976, in order to focus presentations at oral argument.[2a] For the reasons to which we now turn, we believe that these developments amply warrant us in suspending this show cause proceeding.

The Revised Survey and Proposed Interim Rule

For purposes of our review, several premises of the Appeal Board majority's decision have now become critical. Perhaps most importantly, the revised survey of the environmental effects of the fuel cycle called for by the General Statement of Policy was not available when ALAB-349 was rendered. The Appeal Board expressly called attention to this fact and noted that it was not in a position to speculate what the revised survey might disclose. That

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[2a] That memorandum asked the parties to be prepared to address at oral argument, among other issues:

> What relevance have the October 8 Court of Appeals decisions, the environmental survey, the notice of proposed rulemaking, and the staff impact statement to the discussion of license suspension in the General Statement of Policy on August 13, 1976?

being so, it was also not in a position to speculate when or even whether a rule similar to Table S-3 might be adopted.[a] In addition, the Board majority noted that the cost/benefit balance in the Seabrook case appeared to be relatively close. One member of the licensing board had dissented on this issue. Not having reached the merits of the appeals, the Appeal Board was not in a position to decide that issue. It did express the view, however, that Seabrook might be a case where the impacts of the fuel cycle might make a crucial difference in the cost/benefit balance, should the revised survey and/or the reopened rulemaking record show the values contained in present Table S-3 to be seriously in error. Slip. op. pp. 54-55. Furthermore, at the time the Appeal Board's decision was rendered, the court of appeals had not ruled on stay of mandate motions pending before it in the fuel cycle case. Accordingly, the Appeal Board majority was not in a position to take into account the terms of the stay order later issued by the court on October 8, 1976. In sum, the factual and legal universe with reference to which the Appeal Board majority decided ALAB-

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[a] In this regard, the Board stated that:

> To be sure, the policy statement does hold out the possibility that an interim rule might be promulgated as early as this December. It makes it quite plain, however, that the issuance of such a rule (utilizing notice and comment rulemaking procedures) would depend, *inter alia*, upon the revised environmental survey providing sufficient justification for following that path. On this score, the Commission eschewed a prejudgment of either (1) the conclusions which will be reached in the revised survey; or (2) the likelihood that, upon analysis of its content, the survey will be found to supply an adequate foundation for putting forth an interim rule months — and perhaps a year or more — before a sufficient record has been developed to permit the adoption of a final rule.
>
> It would be inappropriate for us to do otherwise.

349 was markedly different from the universe in which we review that decision.

As we view it, of central importance in our disposition of this matter is the issuance of the revised environmental survey called for by the General Statement of Policy, its preliminary review by the Commission, and our resulting proposal of an interim fuel cycle rule. In ALAB-349, the majority summarized its reading of the policy announced by the General Statement for suspension of licenses, saying (slip opinion at 25-26):

> In short, adjudicatory boards must consider suspension motions arising under the policy statement *with due regard for the presently uncertain duration and outcome of the Commission's reevaluation of the reprocessing and waste disposal issues.* It need be added in this connection only that any judgment reached within that framework in a particular case will be subject to alteration once the uncertainties are removed. . . . Any suspension of an existing license which might be decreed at this juncture would likewise have no certain permanent effect; it too could be terminated at any time if warranted by a change in circumstances. (emphasis added)

While the uncertainties of duration and outcome the majority referred to are not yet totally removed — uncertainties that were pivotal to the majority's result — they have been so greatly lessened as to warrant vacation of the Board's suspension order.

In this respect, we note that these suspension proceedings have the character of stay proceedings or other proceedings for interim relief. Harm may arise from either continuing or ceasing the activities in question for the interim period and so assessments of the degree of change likely and the probable time required to fix the outcome are central. We must make our decision based on the best information available. Now, as was not the case when the Gen-

eral Statement of Policy was issued, we have not only the revised environmental survey itself but also the comments filed with us in response to the General Statement of Policy and a Natural Resources Defense Council petition for rulemaking as well. As reflected in the Statement of Considerations accompanying the proposed rule, the lengthy comments of the NRDC, in particular, were taken into account in the survey and so assisted us in reaching our judgment as to the immediacy and likely form of the new rule. 41 Fed. Reg. 45851 (October 18, 1976). As we said at that time "where data necessary for a complete quantative assessment of impact is lacking, the Commission's expert judgment must be brought to bear on the information available."

The environmental effects on a per-reactor basis of the uranium fuel cycle set out in the existing rule were found to be low and a large portion of those impacts is attributable to those parts of the rule upheld by the Court of Appeals. The revised survey confirms the basic correctness of most of the reprocessing and waste management entries in the existing table. The proposed new rule requires only a few substantial changes from the old rule, none of which appears likely to have any substantial total impact on the environment. *See,* "Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Cycle," NUREG-0116 at pp. 2-17 to 2-19 and Table 2.10.[4] Generally, the impacts will be of a magnitude comparable to those which have long been approved in reactor licensing.

[4] In five cases the new rule requires the use of substantially higher numerical values for impact. In three cases the revised survey takes into account items which were not reflected in the old Table S-3: (1) hydrogen chloride gas produced in the incineration of plastics; (2) carbon-14 derived from fuel reprocessing; and (3) buried waste. The hydrogen chloride amounts are small, not radioactive, and no significant impacts are expected. The carbon-14 adds only fractionally to the per reactor whole body dose commitment. No radiological environmental impact from solidified high-level waste is anticipated once it has been buried.

In addition, the revised table shows substantial increases in land commitment and in iodine release at the reprocessing plant. The increase in land commitment amounts to 30 acres per RRY (reference reactor year) temporarily committed and 3 acres per RRY permanently committed. The increased iodine due to iodine in the population thyroid dose commitment is comparable in magnitude to that which occurs incidental to the whole body dose commitment otherwise incurred.

In any event, depending upon the evolution of fuel cycle technology, the radiological impacts from actual facilities constructed in the future may be less than estimates based on present technology.

[5] For construction permits the conclusion is even stronger, since actual generation of waste remains many years in the future.

Transcript of Oral Argument at 41-43 (October 26, 1976). In these circumstances it seems reasonable to suppose that an interim rule can be adopted, and adopted in approximately three months.

Thus, we believe it reasonable to expect that the interim rule as promulgated will closely resemble the proposed rule published on October 13, and like that proposed rule, will not produce results significantly different from those obtained under the current rule (10 CFR § 51.20(e)) which was in effect and applied with reference to the Seabrook licenses. The relatively slight change in the overall impact is of obvious significance to the suspension question, arguing strongly against suspension. It was a factor we could not properly have anticipated in August. When one also considers that the study produced no reason to doubt our earlier conclusion that changes in LWR design would not arise out of this analysis, it becomes apparent that suspension would be inappropriate.[5]

Furthermore, any uncertainty about the appropriate time frame for use in considering suspension of outstanding licenses and permits has been greatly diminished. In ALAB-349, the majority indicated its belief that the General Statement did not permit it to presume that a new fuel cycle rule would be in place by any particular date (slip opinion at 23), and raised the possibility that it might be as long as a year or more before such a rule was promulgated. Slip opinion at 24. But, as we indicated in our October 13, 1976, letter to all parties involved in show cause proceedings based on fuel cycle grounds, the nature and quality of the revised survey now issued provide a basis for some confidence that an interim rule can be in place within three months. Accordingly, in considering the suspension remedy with reference to an outstanding construction permit like Seabrook, it is now possible to set the appropriate time frame as three months.[6] Once an interim rule is in place, whatever results have been reached in the current show cause proceedings, such as Seabrook, might have to be reexamined in the light of that new rule. That would mean that the efforts being put forth by the Licensing and Appeal Boards as well as by the various parties in those proceedings would be largely wasted, since even if decisions were reached in those proceedings, which seems unlikely in most cases, they would be extremely short-lived.[7]

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[6] This is the time frame that the Appeal Board recently chose in *Union Electric Company* (Callaway Plant, Units 1 and 2), ALAB-352 (October 21, 1976), where it decided that construction should be allowed to continue.

[7] This consideration would be especially true here. The Appeal Board has already made an exhaustive analysis of the suspension question. Now that the circumstances are so greatly changed, it would have to reevaluate each factor in light of those new circumstances.

NECNP points out that the revised survey is the submission of a party, the staff; that it has not yet been challenged by the comments of adverse parties; and that in part it rests on judgments, not facts. For these reasons, NECNP concludes that we cannot use the survey in any fashion. We do not accept this view.

To be sure, the staff is a party to the proceedings before us. But it is also an arm of the Commission and is the primary instrumentality through which we carry out our statutory responsibilities. It would be contrary to the facts of the administrative process to pretend that the staff is always merely a party whose submissions are to be given no more weight than those of any other party. On some questions, such as interpretation of statutes or judicial decisions, the staff submissions have no more weight than those of any other party. But in other cases that would not be so. It would be particularly wrong to treat the revised environmental survey as merely that of an interested party since the survey was carried out by the staff at the explicit direction of the Commission, was focused along lines set forth by the Commission, and was subject to ongoing Commission guidance during its preparation. And finally, we have had some opportunity to review the survey ourselves and our preliminary assessment is that it "can serve as an adequate foundation" for an interim rule. 41 Fed. Reg. 45851 (October 18, 1976).

To the extent that the revised survey indicates that some uncertainties do remain as to certain impacts, it is our judgment that those uncertainties are not such as to create any serious doubt as to the validity of the proposed rule. Finally, we note that although counsel for NECNP characterized the survey as a "hasty" one, no party offered any specific criticisms of the survey's conclusions, despite our

express invitation to the parties in setting the case for argument.[8] The survey was a review of existing literature by experts in the various disciplines involved and not an effort to do original research. It was made at a time when the Commission was already substantially engaged in assessing waste management goals and policies.[9] Consequently, much less time was necessary for its production than would have been required to produce new scientific data or to survey a field not already under study.[10]

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[8] Transcript of Oral Argument at 84 (October 26, 1976). The survey was made available to the parties October 13, thirteen days before the argument. Obviously, more criticism may be forthcoming during the comment period or the subsequent hearings. To repeat what we have said above, however, we must decide the suspension issue on the basis of the information now available to us.

[9] Appendix C of the survey describes the variety of programs presently being undertaken in this area by the NRC.

[10] Our reliance on the survey prepared by the NRC staff accords with the "presumption of validity accorded to administrative bodies acting within their sphere of expertise." *TNT Tariff Agents, Inc.* v. *I.C.C.*, 525 F.2d 1089, 1093 (2nd Cir. 1975); *Braniff Airways, Inc.* v. *C.A.B.*, 379 F.2d 453, 460 (D.C. Cir. 1967). In the fuel cycle decision, the court in a footnote implied that staff testimony offered in that proceeding was "peculiarly subject to considerations of self-interest" and would require more than notice and comment before they could be relied on by the agency. *NRDC* v. *NRC, supra,* slip opinion at 25, n.43. The only authority cited by the court for this extraordinary proposition is *Portland Cement Ass'n v. Ruckleshaus,* 486 F.2d 375, 400 n.95 (D.C. Cir. 1973), *cert. denied,* 417 U.S. 921 (1974), which involved a submission to an agency by a private party, not by the agency staff. Also, as the court noted in the fuel cycle decision, the Atomic Energy Commission had both developmental and regulatory responsibilities at the time of the relevant submission. Indeed, the testifying official had predominantly "developmental" responsibilities. The situation here is quite different. Pursuant to the Energy Reorganization Act of 1974, 42 U.S.C. § 5801 *et seq.*, we and our staff have only regulatory functions, thus reducing the possibility of "self-interest" in a staff document. Previous decisions of the D.C. Circuit indicate

To summarize, we now have more and better information than did the Appeal Board which decided ALAB-349 concerning the timing and likely content of a revised interim fuel cycle, or than we had last August. The Commission now has good reason to believe it likely both that there will be an interim rule in place within three months, and that that rule will closely resemble the existing rule, 10 CFR § 51.20(e). Therefore, it seems unlikely that the cost benefit balance in the Seabrook proceeding would be tipped because of those changed impacts.

Significance of the Stay of Mandate in the Fuel Cycle Decision

Subsequent to the decision of the court of appeals in the fuel cycle case, various motions were presented to the court requesting that its mandate be stayed. Separate stay motions were filed by the Commission, the intervenor respondent Vermont Yankee Corporation, and by a group of utility company participants (Baltimore Gas and Electric Company, *et al.*) in the rulemaking culminating in the adoption of Table S-3. The motion of the Commission stated that the Commission was taking certain steps to implement the court's opinion, including that an Atomic Safety and Licensing Board had been reconvened "to consider whether the operating license for Vermont Yankee should be continued, modified, or suspended until an interim fuel cycle rule had been made effective," and that the Com-

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that the Commission may legitimately rely on staff submissions in appropriate circumstances. *Union of Concerned Scientists* v. *A.E.C.*, 499 F.2d 1069, 1077-80 (D.C. Cir. 1974); *Friends of the Earth* v. *AEC*, 485 F.2d 1031, 1033 (D.C. Cir. 1973) (separate statement of Bazelon, C.J.). Such limited reliance is particularly necessary where, as here, we must act on the basis of the information now available.

mission intended to reopen its rulemaking proceeding on the environmental effects of the uranium fuel cycle. The General Statement of Policy was appended to the motion spelling out how the Commission proposed to otherwise implement the court's decision. The Commission indicated that it would adhere to that Statement subject to possible changed procedures in light of the revised survey, and to the possibility that it would seek a further stay of mandate based on its results.[11]

The motion for stay of mandate filed by intervenor-respondent Vermont Yankee Corp. took issue with the Commission's reading of the court's decision as contained in the General Statement of Policy. It noted that the decision itself had not vacated the order authorizing issuance of the license to operate the Vermont Yankee Nuclear Power Station or the license itself. Yet, Vermont Yankee pointed out, the Commission had construed the decision as requiring reconsideration by the NRC of the continued operation of the Vermont Yankee station. Noting that the Commission had reconvened a Licensing Board to consider the status of the Vermont Yankee operating license, the intervenor

[11] The Commission's motion stated,

> As the attached General Statement of Policy reflects, the NRC is considering a further request to this court, within a few weeks after September 30, which could form the basis for future licensing actions. Any such request would be based on a revised and documented environmental survey of the uranium fuel cycle's reprocessing and waste management stages, and would assess the likely impact of renewed licensing as against a continued halt.

Motion for Stay of Mandate and Correction of Opinion, August 20, 1976. That motion sought a stay until September 24, 1976, in order to allow time for the Solicitor General to consider whether a petition for certiorari was warranted. The Commission filed a motion for further stay of mandate, making similar representations, on September 15, 1976.

argued that shutting down Vermont Yankee for even a short time would cause substantial and irreparable harm. The stay was sought to avoid this harm.

Similarly, the third motion for stay of mandate also took issue with the Commission's response to the decision, particularly with respect to show cause proceedings of the kind involved here. That motion argued that reopening proceedings for not only the Vermont Yankee reactor, but "all other licensed reactors as well" during the pendency of Supreme Court review would be inconsistent with the court's decision. As to outstanding construction permits, like the Seabrook permits, the motion cited "delay and disruption of construction schedules" as a reason for a stay. The plain intent of the motion was to produce an order suspending hearings of this kind.

On October 8, 1976, the United States Court of Appeals for the District of Columbia Circuit granted all three pending motions for stay of its mandate in the fuel cycle decision. The court's order granting these motions stated in relevant part as follows:

> Further ordered, by the court, that the foregoing motions for stay of mandate are granted, and the clerk is directed not to issue the mandate herein prior to October 31, 1976, on condition that the United States Nuclear Regulatory Commission shall make any licenses granted between July 21, 1976, and such time when the mandate is issued subject to the outcome of the proceedings herein.

Under applicable rules of appellate procedure (FRAP 41(b)), this means that the mandate in the fuel cycle case will not issue at least until the Supreme Court acts on the pending petitions for certiorari.

The parties take markedly different positions with respect to the significance of the court's order for the issue

presently before the Commission. NECNP argues that, by filing with the court a copy of the August 13 General Statement of Policy the Commission had committed itself to continued adherence to the Statement of Policy, should a stay be granted, apparently without regard to changed circumstances. New England Coalition on Nuclear Pollution Response to Briefs of Applicant and NRC Staff, October 22, 1976, at p. 6; Tr. of Oral Argument (hereinafter "argument"), October 26, 1976, at pp. 78-79. In issuing the stay of mandate, the NECNP argument goes, the Court of Appeals has, in effect, put its imprimatur on the procedures outlined in that statement, including the procedures for show cause proceedings like the Seabrook proceeding. The practical result of the NECNP position is that the Commission is now bound by the fuel cycle decision, as interpreted in the Statement of Policy, even though the mandate has been stayed, and that this suspension proceeding must be allowed to run its course, unless the Commission returns to court and obtains permission to act otherwise.

The applicant, Public Service Company of New Hampshire, reads the order very differently. Under its interpretation, the Court of Appeals decision invalidating portions of Table S-3 will have no legal effect until the mandate issues, save that new licenses must be conditioned on the outcome of the reopened rulemaking proceeding. Brief of Applicants, October 18, 1976 (hereinafter "Applicants' Brief"), at p. 29. Since Table S-3 was duly factored into the cost/benefit analysis in the Seabrook proceeding, the applicant's argument runs, its outstanding construction permits could not now be suspended on fuel cycle grounds absent new facts — facts which the revised survey has not uncovered. Beyond that, the applicant reads the Court of Appeals order as, in practical effect, an amendment or clarification of the court's earlier decision. Thus it argues

that the court's language calling for conditioning of new licenses and permits on the outcome of the reopened rulemaking proceeding shows that the court never contemplated a cessation on licensing. Applicants' Brief, at p. 29. It argues from this that, *a fortiori*, the court did not contemplate any suspension of outstanding construction permits. Applicants' Brief, at pp. 29-30.

The staff believes that the General Statement of Policy should be viewed as a reasonable interpretation of the court's opinion, at the time it was issued, but one subject to revisitation in light of the completed survey and the court stay. Argument, at pp. 40-41. The staff thus rejects the intervenor NECNP's position that, notwithstanding the stay, the Commission is somehow bound by the court of appeals decision now that the stay has issued. In its view, the stay reflects the court's recognition that its decision may be overturned and that any mandatory effect can appropriately be postponed until the possibility of a successful appeal has been resolved. Argument at p. 39. But the Commission remains free, if the facts developed so warrant, to suspend licenses or take any other action required under its ordinary regulatory authority. Argument at p. 40. Under the staff's approach, the only legal constraint imposed by the stay is that new licenses issued after July 21, 1976, must be conditioned on the outcome of the fuel cycle decision as required by the explicit terms of the stay order. On the facts revealed by the survey, and considering the explicit permission given to continue licensing, the staff finds no basis in policy for continuing the present suspension proceedings.

The terms of the court's stay order do not directly answer the present question. However, we think it clear that the staff's position as to its effect is the most logical and

reasonable one.[12] There are several difficulties with the intervenor NECNP position. First, their contention that new operating licenses and construction permits may not be issued flies in the face of the explicit terms of the court's order granting the stay. Moreover, NECNP's position is directly contrary to hornbook principles of laws governing stays. A court acts only through its mandate. *Bailey* v. *Henslee*, 309 F.2d 840, 844 (8th Cir. 1962). When a mandate is stayed, a decision has no binding effect, save as the stay might be conditioned, as it was here with respect to the outcome of the fuel cycle decision. Furthermore, the NECNP position simply ignores the fact that the court granted not only the Commission's motion but also the motions of the Vermont Yankee Corporation and the utility group. Those petitions said nothing about continued adherence to the General Statement of Policy. On the contrary, they argued that suspension of construction permits, like the Seabrook permit, would be improper at least until the Supreme Court had an opportunity to decide whether to review. Finally, it would have been a simple matter for the court to say explicitly that its granting of a stay was conditioned on adherence to the General Statement of Policy. This it did not do.[13]

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[12] Admittedly, the meaning of the court's order is subject to different interpretations. We are transmitting a copy of this decision setting forth our assessment of the meaning of the order to the court for its information.

[13] NECNP attempts to explain the language about conditioning of new licenses by reference to the General Statement of Policy's statement that new licenses not requiring NEPA review (see 10 CFR 51.5(b)) and, if warranted by the revised survey, licenses in uncontested cases, might issue during the interim period. We see no merit in this contention. Such licenses were not at issue and were not specifically the subject of debate in the stay motions; they were referred to in the Statement of Policy, but not prominently discussed. Furthermore, the first category of licenses encompasses

We wish to make clear, however, that in rejecting the NECNP position, we are not adopting the position that the Commission is disabled from acting with respect to Seabrook and other similar permits unless it goes through rulemaking procedures. Our discretion is not so cabined and confined. As we have stated, our review of the revised survey leads us to conclude, as a matter of discretion, that the Seabrook permit should not be suspended. However, had the updated survey indicated that the impacts associated with the uranium fuel cycle were much more serious than had heretofore been thought the case, or had the process leading to possible adoption of an interim rule appeared more complex, we might well have continued these suspension proceedings. There is, in our view, no serious question about our power so to act on the basis of information at hand in individual proceedings, without need for special rulemaking.

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activities, such as fuel loading or low-power testing, which are not "major federal actions" within the meaning of NEPA. It would be anomalous for the court to require that such licenses be conditioned on the outcome of a rulemaking designed to implement NEPA. The second category — licenses in uncontested cases — encompasses only a small number of licenses. About 70% of the active proceedings before the Commission, in which an applicant is seeking either a construction permit or an operating license for a commercial nuclear reactor, are presently contested, and the percentage of contested cases has been steadily rising.

Conclusion

The applicant and regulatory staff contend that the Appeal Board majority made errors of fact and misapplied the standards set forth in the General Statement of Policy in granting the suspension motion. Thus, the applicant claims that the Board's assessment of the amount of money that will not be spent if construction is halted was substantially too high and that the Board overestimated the environmental impacts associated with continued construction. The staff maintains that the increased investment which the Appeal Board majority thought might "tilt" the cost/benefit analysis in favor of Seabrook had already been included in the Licensing Board's cost/benefit analysis and that, in any event, the Appeal Board's "tilting" analysis was unbalanced because it failed to consider whether suspension of construction might "tilt" the balance against Seabrook and in favor of alternatives to it. Tr. pp. 52-53.

We need not, and do not, resolve these complex and essentially factual contentions, for several reasons. As a general matter, this Commission does not sit to review factual determinations made by its subordinate panels. While, of course, we have the authority to do that, and have exercised that authority on occasion (*see Consolidated Edison Company of New York, Inc.* (Indian Point Station, Unit No. 3), 2 NRC 379), it is simply practical for us to do so in most cases. We have discussed, with the benefit of hindsight, how key premises of the Appeal Board majority's decision have been called into question by subsequent developments. Assuming, then, that there may be merit in some of the exceptions raised by the applicant and staff with respect to the decision below, and given practical constraints, these matters could only be resolved by remanding the case to the Board with instructions to reapply the stan-

dards set forth in the General Statement of Policy in the light of changed circumstances.

Several considerations lead us not to adopt that course. In the first place, the parties have made it clear that they do not desire a remand of this matter. Tr. pp. 36, 61, 104. Moreover, with reference to environmental impacts to be anticipated in the period between now and anticipated adoption of an interim rule — obviously a prime consideration in considering a suspension of construction to protect environmental values — we note that the Appeal Board majority did not find such impacts sufficient in themselves to justify suspension on fuel cycle grounds, and that the intervenor NECNP does not except to that conclusion. Furthermore, we note that the issue of anticipated environmental impacts is presently under consideration by the Appeal Board in connection with its reconsideration of an application for a stay pending appeal. Thus, the matter of environmental impacts in the near term is being carefully considered.

But while these considerations point away from a remand in this proceeding, we believe that the considerations of broader impact we have discussed — concerning the timing and likely content of a revised fuel cycle rule — warrant suspension of this and other ongoing proceedings concerning outstanding licenses and permits pending anticipated adoption of a revised interim rule, probably by January 1977. Substantially for the reasons given in this opinion, we are in substance granting the Vermont Yankee Corporation's motion by suspending, with one exception,[14] other ongoing proceedings based on the General Statement of

[14] The *Midland* proceeding will continue with respect to other issues, with fuel cycle issues to be held in abeyance pending adoption of an interim rule.

Policy. The effect of these actions is to shift from the case-by-case approach we felt constrained to adopt with respect to outstanding licenses in the Statement of Policy, before we had the benefit of the revised survey. In the light of the survey, we now feel amply justified in making a generic determination that outstanding licenses need not be considered for suspension on fuel cycle grounds during the relatively brief period between this action and anticipated adoption of a revised rule.

The entry of orders in this and other pending show cause proceedings concerning outstanding licenses and permits is also fully consistent with a Supplemental General Statement of Policy we are issuing today setting forth interim procedures to govern assessment of fuel cycle impacts associated with new licenses and permits. In such cases, we are directing the Licensing Boards, until an interim rule is in place, to apply present Table S-3 values and to determine in addition whether the new values indicated by the revised survey would change the cost/benefit balance adversely to the proposed reactor. Should the new values tilt the balance in a particular case, action on the license or permit will be withheld pending adoption of an interim rule. The differing approaches we propose to follow with respect to new as compared with outstanding licenses are fully appropriate. The court of appeals stay of mandate is conditioned upon our making new licenses subject to the outcome of that proceeding. To help ensure that any licenses issued will, in fact, be able to comply with any such condition, we have directed that Licensing Boards and our staff apply the data supplied by the survey as the best present indication of the ultimate outcome of our reopened proceedings. The stay of mandate's condition does not apply to outstanding licenses like Seabrook that were issued before the court's decision. In view of the necessary disruptions attendant upon the suspension remedy, the results of the revised survey, and the time frame for a revised rule, we conclude that that remedy is not presently warranted.

This does not necessarily mean that the results of the reopened rulemaking proceeding cannot ultimately be factored into consideration of whether an outstanding license or permit should be suspended, conditioned, or revoked. Indeed, given the time schedule of the present proceeding,[15] it appears that the Appeal Board will be in a position, if necessary, to factor the new values in the anticipated interim rule into the cost/benefit analysis when it decides the merits of the pending appeals from the initial decision. See *Potomac Electric Power Co.* (Douglas Point Nuclear Generating Station), 8 AEC 79 (1974). And when the interim rule is in place, we will reconsider whether the other proceedings we are suspending today should be reopened.

In view of the foregoing, these proceedings are suspended.[16] The outstanding construction permits shall remain in effect, subject to the appeal and stay proceedings pending before the Appeal Board.

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[15] Oral argument is anticipated in mid-December. Order of September 21, 1976. Given the complexity of the case, it seems unlikely that a decision on the merits of all issues would be rendered any earlier than February 1977.

[16] We, of course, reserve authority to take action in the interim, should unexpected developments require.

It is so ORDERED.[17]

SAMUEL J. CHILK
Secretary of the Commission

Dated at Washington, D.C.
this 5th day of November, 1976.

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[17] We have received three requests from non-parties for an opportunity to participate or file papers in this proceeding. Consumers Power Company has filed a motion for leave to file a brief amicus curiae with respect to ALAB-349. The Governor of the State of New Hampshire filed a later petition for intervention, and also requested leave to file an amicus statement. The New England Council for Economic Development requested permission to insert into the record various petitions and letters, and a statement. The intervenor NECNP opposed all of those requests. The staff opposed the petition to intervene but did not object to the requests to file written submissions.

The late petition to intervene is denied. The requests to file written submissions are granted on an amicus curiae basis.

FILED
SEP 21 1976
MICHAEL RODAK, JR., CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-~~76-419~~

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., NEW ENGLAND COALITION ON NUCLEAR POLLUTION and CONSOLIDATED NATIONAL INTERVENORS, INC.,

Respondents

APPENDIX TO THE PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

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Notice: This opinion is subject to formal revision before publication in the Federal Reporter or U.S. App. D.C. Reports. Users are requested to notify the Clerk of any formal errors in order that corrections may be made before the bound volumes go to press.

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 74-1385

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL, PETITIONER

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION AND UNITED STATES OF AMERICA, RESPONDENTS

VERMONT YANKEE NUCLEAR POWER CORPORATION, INTERVENOR

No. 74-1586

NATURAL RESOURCES DEFENSE COUNCIL, INC., AND CONSOLIDATED NATIONAL INTERVENORS, PETITIONERS

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION AND UNITED STATES OF AMERICA, RESPONDENTS

BALTIMORE GAS AND ELECTRIC CO., ET AL., INTERVENORS

Petition for Review of an Order of the Nuclear Regulatory Commission

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Argued May 27, 1975

Decided July 21, 1976

George W. Mayo, Jr., with whom *Robert M. Jeffers, David J. Hensler, Patrick M. Raher, Richard E. Ayres* and *Anthony Z. Roisman*, were on the brief for petitioners in No. 74-1385.

David Hensler and *Patrick M. Raher*, with whom *Robert M. Jeffers, George W. Mayo, Jr., Richard E. Ayres* and *Anthony Z. Roisman*, were on the brief for petitioners in No. 74-1586.

James A. Glasgow, Attorney, U.S. Nuclear Regulatory Commission, with whom *Wallace H. Johnson*, Assistant Attorney General, *Edmund B. Clark, John J. Zimmerman*, Attorneys, Department of Justice, *Raymond M. Zimmet*, Acting Solicitor, U.S. Nuclear Regulatory Commission, were on the brief for respondents. *Marcus A. Rowden, Jerome Nelson, Joseph DiStefono* and *Guy H. Cunningham, III*, Attorneys, U.S. Nuclear Regulatory Commission and *George R. Hyde* and *Edward J. Shawaker*, Attorneys, Department of Justice, also entered appearances for respondents.

George C. Freeman, Jr., with whom *W. Taylor Reveley, III, David S. Brollier* and *F. Case Whitlemore* were on the brief for intervenor, Baltimore Gas and Electric Company in No. 74-1586.

Thomas G. Dignan, Jr., for intervenor, Vermont Yankee Nuclear Power Corporation in No. 74-1385.

Louis J. Lefkowitz, Attorney, General of the State of New York and *John F. Shea, III*, Assistant Attorney General of the State of New York filed a brief on behalf of the State of New York as *amicus curiae*.

Arvin E. Upton, Harry H. Voight and *Eugene R. Fidell*, Filed a brief on behalf of Commonwealth Edison Company, Consolidated Edison Company of New York, Inc., Niagara Mohawk Power Corporation, Omaha Public Power District Powers Authority of the State of New

York and Rochester Gas and Electric Corp., as *amici curiae* urging affirmance.

Before: BAZELON, *Chief Judge*, EDWARDS,* *Circuit Judge* for the Sixth Circuit and TAMM, *Circuit Judge*

Opinion for the Court filed by *Chief Judge* BAZELON.

Separate statement of *Chief Judge* BAZELON.

Separate statement filed by *Circuit Judge* TAMM, concurring in the result.

BAZELON, *C.J.*: The problems posed in both these cases relate to the manner and extent to which information concerning the environmental effects of radioactive wastes must be considered on the public record in decisions to license nuclear reactors.

I. INTRODUCTION

Appeal number 74-1385 involves a proceeding to license a specific nuclear reactor (the Vermont Yankee Nuclear Power Station located near Vernon, Vermont). Pursuant to the National Environmental Policy Act,[1] petitioners[2]

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* Sitting by designation pursuant to 28 U.S.C. § 291(a).

[1] 42 U.S.C. § 4321, *et seq.* (1970) (hereafter "NEPA").

[2] Petitioners in 74-1385 are the Natural Resources Defense Council, Inc. ("NRDC") and the New England Coalition on Nuclear Pollution, Inc., voluntary organizations supported by contributions from individual members, which intervened in the licensing proceedings.

NRDC is also a petitioner in 74-1586, where it is joined by Consolidated National Intervenors, Inc. ("CNI"), a coalition of almost eighty public interest groups and individuals which actively participated in the rule making proceedings. Several groups such as the Sierra Club and the Union of Concerned Scientists which are members of CNI also made individual presentations.

[Continued]

sought consideration of the environmental effects of that portion of the "nuclear fuel cycle" [3] attributable to operation of that reactor. The Appeal Board held that Licensing Boards [4] must consider the environmental effects of transportation of fuel to a reactor and of wastes to reprocessing plants, but need not consider the "operations of the reprocessing plants or the disposal of wastes" in individual licensing proceedings. *In re Vermont Yankee Nuclear Power Corp.*, ALAB-56, 4 AEC 930 (June 6, 1972), I-J.A. 72, 76.[5]

Appeal number 74-1586 involves a rulemaking proceeding which the Commission instituted shortly thereafter with specific reference to the *Vermont Yankee* decision. The purpose of the rulemaking was to reconsider whether environmental effects of all stages of the uranium fuel cycle should be included in the cost-benefit analysis for licensing individual reactors. 37 Fed.Reg. 24191 (Nov. 15, 1972), II-J.A. 1. The Commission concluded the environmental effects of the fuel cycle, including waste disposal, were "relatively insignificant," [6] but that it was preferrable to take them into account. Therefore, a rule was promulgated requiring a series of specified numerical values (set out as Table S-3 accompanying the rule) be factored into the cost-benefit analysis

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Since on all but a few issues these groups adopted the same positions, for convenience they are referred to collectively as "public interest intervenors" in order to distinguish them from a group of 14 utility companies which also actively participated in the rulemaking. One member of that group, Baltimore Gas & Electric Co., has also intervened in the proceedings in this court.

[3] The "nuclear fuel cycle" is that chain of activities beginning with mining of uranium ore and extending through final reprocessing and disposal of radioactive wastes by which fuel for a nuclear reactor is processed. Most of these events take place off the individual reactor site, but are necessary to its continued operation.

Although the nuclear fuel cycle encompasses numerous stages, these cases are concerned almost exclusively with the reprocessing and disposal of wastes which the public interest intervenors contend account for by far the largest portion of the environmental impact of the fuel cycle.

The word *disposal* may itself be misleading, for it connotes some physical or chemical step which renders the wastes less toxic. Under present technology, the only known agent of detoxification is the passage of great amounts of time. The phase of the nuclear fuel cycle referred to as "disposal" generally refers only to storage of wastes in physical isolation.

[4] Licensing of commercial nuclear reactors embraces two separate proceedings—the first to determine whether the facility should be constructed; the second to determine whether it should be licensed to operate. *See generally*, Power Reactor Development Corp. v. I.U.E.W., 367 U.S. 396 (1961).

Proceedings are conducted before a three-member Atomic Safety and Licensing Board, 42 U.S.C. § 2241, which is the counterpart of an Administrative Law Judge in other agencies. The Licensing Board is typically composed of two nuclear physicists and one lawyer who serves as chairman.

[Continued]

The Atomic Energy Commission ("AEC") has delegated its review functions over Licensing Board decisions to Atomic Safety and Licensing Appeal Boards, subject to discretionary determination by the AEC itself of "major or novel questions of policy, law or procedure." 10 C.F.R. § 2.785(a); *id.* (d)(1).

The AEC was abolished by the Energy Reorganization Act of 1974, 88 Stat. 1233 *et seq.*, and its functions divided between the United States Nuclear Regulatory Commission (NRC), which has been substituted as formal respondent by order of this court, and the Energy Research and Development Agency (ERDA). For consistency, the terminology AEC or "the Commission" is used throughout.

[5] References to the joint appendix in 74-1385 are in the form "I-J.A." Both volumes of the appendix in 74-1586 are referred to as "II-J.A."

[6] *See infra* note 19.

for an individual reactor. These values are intended to represent the incremental contribution of an additional reactor to the environmental effect of the fuel cycle. The rule further provides that in addition to Table S-3, "No further discussion of such environmental effects shall be required." [7] Finally, it is declared that "[i]nsofar as this rule differs" from that announced in the *Vermont Yankee* decision, *supra*, that decision shall have "no further precedential significance." *Id.*

II. VERMONT YANKEE (74-1385)

It is undisputed that a reactor licensing is a "major Federal action[] significantly affecting the quality of the human environment" which requires a "detailed" environmental impact statement under § 102(2)(C) of NEPA, 42 U.S.C. § 4332(2)(C). That section requires an impact statement to consider, *inter alia*,

> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> * * * *
>
> (v) any irreversible and irretriveable commitments of resources which would be involved in the proposed action should it be implemented.

The plain meaning of this language encompasses radioactive wastes generated by the operations of a nuclear power station, just as it does the stack gases produced by a coal-burning power plant.

Nor are the wastes generated by the subject reactor *de minimis*. We were informed at argument that the Vermont Yankee plant will produce approximately 160 pounds of plutonium wastes annually during its 40-year

[7] 39 Fed.Reg. 14188, 14191 (April 22, 1974), II-J.A. 507, 509. The rule is codified as Part 51.20(e) of 10 C.F.R. (1975) in a section entitled "Applicant's Environmental Report—Construction Permit Stage."

life span.[8] Plutonium is generally accepted as among the most toxic substances known; inhalation of a single microscopic particle is thought to be sufficient to cause cancer.[9] Moreover, with a half-life of 25,000 years, plutonium must be isolated from the environment for 250,000 years before it becomes harmless. Operation of the facility in question will also produce substantial quantities of other "high-level" [10] radioactive wastes in the form of stron-

[8] There has been some disagreement between the parties concerning the exact amounts of wastes to be produced. We are required to consider projects from the perspective of their potential effect on the "quality of the human environment." 42 U.S.C. § 4332(2)(C). Since plutonium and other high level wastes may be toxic in extremely small quantities, these variances are not of an order which would affect our conclusions.

[9] *See* Luschbauch & Langham, *A Dermal Lesion from Implanted Plutonium*, 86 ARCHIVES OF DERMATOLOGY at 121-24 (Oct. 1962).

The dangers of plutonium must be kept in perspective. Certain industrial chemicals and substances common in laboratories may be equally toxic. B. Cohen, *Environmental Hazards in High-Level Radioactive Waste Disposal*, 2 (unpublished). Recent theoretical calculations suggest many would survive even intentional dispersal of plutonium over a city. B. Cohen, *The Hazards in Plutonium Dispersal*, Institute for Energy Analysis, Oak Ridge, Tenn. (1975). *See also* Bethe, *The Necessity of Fission Power*, 234 SCIENTIFIC AMERICAN 21, 29 (1976).

[10] According to a pamphlet published by the AEC's office of Information to inform the general public, "high-level" wastes consist primarily of highly radioactive spent reactor fuel containing "several hundred to several thousand curies per gallon in liquid form . . . ." Fox, *Radioactive Waste*, AEC No. IB-508, 14-15 (rev. ed. 1969). They "pose the most severe potential health hazard and the most complex technical problems in management," *id.*, and thus attracted the bulk of the attention in these proceedings.

Less radioactive "low-level" wastes are also produced, primarily when objects such as pipes, rags or other debris are exposed to radioactivity produced in the reactor core. Low-

tium-90 and cesium-137 which, with their shorter, 30-year half-lives, must be isolated from the environment for "only" 600 to 1000 years.[11]

The Appeal Board advanced two major arguments to justify its decision that reprocessing and waste disposal issues need not be considered at the licensing stage: (1) that these issues are too speculative; and (2) that they are more appropriately considered when reprocessing and waste disposal facilities are themselves licensed. We turn now to these contentions.

The Board agreed that "there will be an incremental environmental effect ultimately resulting from the operation of this reactor as the result of the operation of whatever reprocessing and disposal grounds may from time to time be used during the life of the plant." [12] In its opin-

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level wastes have long been disposed of in commercial burial grounds and were thought not to constitute a major problem. Recently, however, EPA and GAO have publicly reported radioactive material has been "migrating" from such facilities at a rate "much more rapid than scientists thought possible." *See* "New Alarms About Old Nuclear Wastes," BUSINESS WEEK (Feb. 2, 1976) at 17; "GAO Reports New Nuclear Garbage Problem," 6 SCIENCE & GOV. RPT. 8 (Feb. 1, 1976).

[11] The general outlines of the high-level waste disposal problem are undisputed. In Scientists' Institute for Public Information, Inc. v. AEC (*"SIPI"*), 156 U.S.App.D.C. 395, 481 F.2d 1079, 1098 (1973), this court observed:

> These wastes will pose an admitted hazard to human health for hundreds of years, and will have to be maintained in special repositories. *The environmental problems attendant upon processing, transporting and storing these wastes . . . warrant the most searching scrutiny under NEPA.* [Emphasis added.]

[12] I-J.A. 80. We note at the outset that this standard is misleading because the toxic life of the wastes under discussion far exceeds the life of the plant being licensed. The

ion, however, these effects were too "contingent and presently indefinable" to be evaluated at the time of licensing in view of the 40-year expected life of the reactor. The Board wrote:

> It is evident to us that evaluation of the environmental effects of the operation of one or more unidentifiable reprocessing plants, employing separation processes which are unidentified and which may or may not now be known or used, during the course of the forty-year life of the plant, is not possible at this time and in this proceeding.

I-J.A. 82. This approach was decisively rejected in *SIPI*, supra, note 11, 481 F.2d at 1092. There we held that the obligation to make reasonable forecasts of the future is implicit in NEPA and therefore an agency cannot "shirk [its] responsibilities under NEPA by labeling any and all discussion of future environmental effects as 'crystal ball inquiry.'" "Meaningful information" concerning the effects of waste reprocessing and disposal technology is presently available, *see SIPI*, 481 F.2d at 1094, 1096. As the Board noted, a reprocessing plant has been operated by the Commission for some time, and additional plants are under construction. I-J.A. 79. The possibility that

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environmental effects to be considered are those flowing from reprocessing and passive storage for the full detoxification period.

It is also misleading to focus solely on the *incremental* impact of the waste generated by an additional reactor. *See* NRDC v. Callaway, 524 F.2d 79, 88 (2d Cir. 1975):

> [A]n agency may not . . . treat[] a project as an isolated "single-shot" venture in the face of persuasive evidence that it is but one of several substantially similar operations. . . . To ignore the prospective cumulative harm under such circumstances could be to risk ecological disaster.

See also Kleppe v. Sierra Club, 44 U.S.L.W. 5104, 5109 (U.S., June 28, 1976) (Comprehensive EIS should address cumulative impact of proposals "pending concurrently"); *cf. id.* at 5111 n.26.

improved technology may be developed during the 40-year life span of a reactor does not render consideration of environmental issues too speculative, as the Board appears to suggest. NEPA's requirement for forecasting environmental consequences far into the future implies the need for predictions based on existing technology and those developments which can be extrapolated from it.[13]

As more and more reactors producing more and more waste are brought into being, "irretrievable commitments [are] being made and options precluded," *see SIPI*, 481 F.2d at 1094, 1098, and the agency must predict the environmental consequences of its decisions as it makes them. *See Aberdeen & Rockfish R.R. v. SCRAP*, 422 U.S. 289, 320 (1975).

The second argument advanced by the Board is that licensing proceedings for reprocessing plants are a more "appropriate proceeding" in which to weigh the environmental effects of reprocessing and waste disposal. I-J.A. 86. Licensing of a reprocessing plant or waste disposal facility is itself a "major Federal action" affecting the environment which requires a NEPA statement. The real question posed by the Board's opinion is whether the environmental effects of the wastes produced by a

[13] Technical breakthroughs not now foreseen may of course render these assumptions too conservative, and environmental costs may turn out to be less than expected. The alternative is to rest on a blind faith in technological progress. This the draftsmen of NEPA were quite evidently unwilling to do.

Conversely, unforeseen problems sometimes crop up to forestall anticipated technological solutions. *See, e.g., infra* notes 46 & 47. Where important changes in the state of the art or other major uncertainties are in the offing, meaningful assessments of future environmental impacts might be facilitated by making two alternative estimates: one based only on existing technology and another which takes into account developments which may reasonably be anticipated. We have no occasion in this case to decide whether a court could ever require such a procedure.

nuclear reactor may be ignored in deciding whether to build it because they will later be considered when a plant is proposed to deal with them. To answer this question any way but in the negative would be to misconstrue the fundamental purpose of NEPA.[14] Once a series of reactors is operating, it is too late to consider whether the wastes they generate should have been produced, no matter how costly and impractical reprocessing and waste disposal turn out to be; all that remain are engineering details to make the best of the situation which has been created.[15] NEPA's purpose was to break the cycle of such incremental decision-making:

[14] *Cf.* Calvert Cliffs' Coordinating Comm. v. AEC, 449 F.2d 1109, 1128 (D.C.Cir. 1971). There the Commission proposed to forestall consideration of environmental issues in granting reactor construction permits until an operating license was issued. This court pointed out: "Once a facility has been completely constructed, the economic cost of any alteration may be very great . . . . By refusing to consider requirement of alterations until construction is completed, the Commission may effectively foreclose the environmental protection desired by Congress."

[15] Intervenor Baltimore Gas & Electric Co. contended at argument "however broad NEPA may be, it does not require agencies like the AEC, ICC or CAB to examine in the impact statement the very reason for being of that agency." We have already rejected that argument in Natural Resources Defense Council v. Morton, 458 F.2d 827, 836 (D.C.Cir. 1972): "The need for continuing review of environmental impact of alternatives under NEPA cannot be put to one side on the ground of past determinations by Congress or the President." *See also* Calvert Cliffs' Coordinating Comm. v. AEC, *supra* note 14, 449 F.2d at 1127. One function of NEPA is to provide systematic feedback to Congress and the public on the environmental costs of implementing programs so that they may be re-evaluated in the light of experience.

Moreover, the "reason for being" of the agencies administering the Atomic Energy Act of 1954 has never been unlimited development of civilian nuclear power without re-

> Policy is established by default and inaction. Environmental problems are only dealt with when they reach crisis proportion . . . . Important decisions concerning the use and shape of man's environment continue to be made in small but steady increments which perpetuate rather than avoid the recognized mistakes of previous decades.

Senate Rep. No. 296, 91st Cong., 1st Sess. 5 (1969). Decisions to license nuclear reactors which generate large amounts of toxic wastes requiring special isolation from the environment for several centuries are a paradigm of "irreversible and irretrievable commitments of resources" which must receive "detailed" analysis under § 102(2)(C)(v) of NEPA, 42 U.S.C. § 4332(2)(C)(v).[16] We therefore hold that absent effective generic proceedings to consider these issues, they must be dealt with in individual licensing proceedings.[17]

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gard to the costs or risks. The Congressionally declared purpose is only to "encourage widespread participation in the development and utilization of atomic energy for peaceful purposes *to the maximum extent consistent with . . . the health and safety of the public.*" 42 U.S.C. § 2013(d) (1970) [emphasis added].

[16] No one suggests that the two sentence statement in the Vermont Yankee Final Environmental Impact Statement is adequate to satisfy § 102(2)(c). It reads:

> Long-lived radioactive materials will be produced by fission of nuclear fuel in the core of the reactor and neutron activation of reactor parts near the core. The eventual disposal and storage of radioactive materials will require a certain amount of space, probably in an area remote from this plant, for a very long period of time, and could for all practical purposes be considered as an irreversible commitment of resources.

I-J.A. 263.

No attempt is made to estimate the quantity of wastes produced, describe what precautions must be taken, or assess the costs and risks involved.

[17] When the final full-power, full-term operating license for the Vermont Yankee Nuclear Power Station was issued, the

The order granting a full-term license for the Vermont Yankee plant is hereby remanded to await the outcome of further proceedings in the rulemaking, discussed hereafter.

III. RULEMAKING (74-1586)

(A.)

The notice of proposed rulemaking, 37 Fed.Reg. 24191 (Nov. 15, 1972), suggested as a possible alternative to the rule of *Vermont Yankee*, *supra*, that a series of specified numerical values (set out as Table S-3 in the notice) be factored into the cost-benefit analysis for individual

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Appeal Board "declined to re-examine" its earlier holdings that reprocessing and waste disposal issues need not be considered, since the rulemaking proceeding was then pending. I-J.A. 495-96. As a result, the Government argues the only issue raised is "whether the Commission under the National Environmental Policy Act (NEPA) could deal with fuel cycle issues by rulemaking, instead of in the context of numerous separate adjudications, such as the Vermont Yankee licensing proceeding." Respondent's brief at 5.

No one questions the AEC's power to do so in this proceeding. *Cf.* Union of Concerned Scientists v. AEC, 499 F.2d 1069 (D.C.Cir. 1974). Nor do we doubt that generic proceedings are a more efficient forum in which to develop these issues without needless repetition and potential for delay. *See* Ecology Action v. AEC, 492 F.2d 998, 1002 (2d Cir. 1974) (Friendly, J.) (dictum); Note, "The Use of Generic Rulemaking to Resolve Environmental Issues in Nuclear Power Plant Licensing," 61 VA.L.REV. 869, 878-79 (1975). However, the decision to hold generic proceedings rather than to leave these issues for individual licensings is left to agency discretion. *See infra* note 27.

What the agency may not do, consistent with NEPA, is to fail to give these issues adequate consideration in either forum. Thus, until an adequate generic proceeding is held (which may also consolidate a number of pending cases, *see, e.g.*, Specialized Common Carrier Services, 29 F.C.C. 870 (1971)), these issues will be ripe in individual licensing proceedings.

reactors.[18] These values were intended to represent the

[18]

TABLE S-3.—*Summary of environmental considerations for uranium fuel cycle*

[Normalized to model LWR annual fuel requirement]

Natural resource use	Total	Maximum effect per annual fuel requirement of model 1,000 MWe LWR
Land (acres):		
Temporarily committed	68	
Undisturbed area	43	
Disturbed area	18	Equivalent to 90 MWe coal-fired powerplant.
Permanently committed	4.6	
Overburden moved (millions of MT)	2.7	Equivalent to 90 MWe coal-fired powerplant.
Water (millions of gallons):		
Discharged to air	156	≈2 percent model 1,000 MWe LWR with cooling tower.
Discharged to water bodies	11,040	
Discharged to ground	123	
Total	11,319	<4 percent of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousands of MW-hour)	317	<5 percent of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT)	115	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	92	<0.2 percent of model 1,000 MWe energy output.
Effluents—chemical (MT):		
Gases (including entrainment):[1]		
SO_x	4,400	Equivalent to emissions from 45 MWe coal-fired plant for a year.
NO_2[2]	1,177	
Hydrocarbons	13.5	
CO	28.7	
Particulates	1,154	
Other gases:		
F	.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards—below level that has effects on human health.
Liquids:		
$SO_4^=$	10.3	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constituents that require dilution and the flow of dilution water are: NH_3—600 cfs; NO_3—20 cfs; Fluoride—70 cfs
NO_3^-	26.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl^-	8.6	
Na^+	14.9	
NH_3	11.5	
Fe	.4	
Tailings solutions (thousands of MT)	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—Radiological (curies):		
Gases (including entrainment):		
Rn-222	73	Principally from mills—maximum annual dose rate <4 percent of average natural background within 5 mi of mill. Results in 0.06 man-rem per annual fuel requirement.
Ra-226	.02	
Th-230	.02	
Uranium	.032	
Tritium (thousand)	16.7	Principally from fuel reprocessing plants—Whole body dose is 6 man-rem per annual fuel requirements for population within 50 mi radius. This is <0.007 percent of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/yr has been included in fission products and transuranics total.
Kr-85 (thousands)	330	
I-129	.0024	
I-131	.024	
Fission products and transuranics	1.01	
Liquids:		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production—concentration 5 percent of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Rn-106[3]	.15	From reprocessing plants—maximum concentration 4 percent of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (thousands)	2.5	
Solids (buried):		
Other than high level	601	All except 1 Ci comes from mills—included in tailings returned to ground—no significant effluent to the environment. 1 Ci from conversion and fuel fabrication is buried.
Thermal (billions)	2,260	<7 percent of model 1,000 MWe LWR.
Transportation (man-rem): Exposure of workers and general public.	.334	

[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.2 percent from natural gas use and process.
[3] Co-127 (0.075 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

incremental contribution of a hypothetical 1000 MWe model light water reactor to the total environmental effect of the uranium fuel cycle. While expressed as numerical values in Table S-3, a fair summary of the conclusions incorporated into the rule is that the environmental effects of the fuel cycle are "insignificant." [19] The notice further stated that the "supporting data for this summary table" is contained in a staff document entitled the "Environmental Survey of the Nuclear Fuel Cycle" (Nov. 6, 1972) [hereafter "Environmental Survey"], which was simultaneously made public.[20]

An "informal rulemaking hearing" of the "legislative-type" was scheduled to receive comments in the form of "oral or written statements." [21] By subsequent notice, the Commission designated a three-member hearing board to preside, and reiterated, "The procedural format for the hearing will follow the legislative pattern, and no discovery or cross-examination will be utilized." 38 Fed. Reg. 49 (Jan. 3, 1973).[22]

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[19] In explaining its decision not to require Table S-3 to be applied retroactively, the Commission stated:

> In view of the fact that the environmental effects of the uranium fuel cycle have been shown to be relatively insignificant, the Commission believes that it is unnecessary to apply the [rule] to . . . environmental reports submitted prior to its effective date. . . .

39 Fed.Reg. 14190 (April 22, 1974); II-J.A. 508.

[20] 37 Fed.Reg. 24192 n.1; *id.*, 24193.

It is conceded that the Environmental Survey was not "intended to be a detailed environmental statement as defined in the National Environmental Policy Act of 1969. . . ." I-J.A. 512; 39 Fed.Reg. 14188 (April 22, 1974), II-J.A. 507.

[21] 37 Fed. Reg. 24191 (Nov. 15, 1972).

[22] It should be noted that members of the presiding hearing board were empowered to ask questions, and occasionally did. In addition, "over 100 pages of handwritten calculations" and

The primary argument advanced by the public interest intervenors is that the decision to preclude "discovery or cross-examination" denied them a meaningful opportunity to participate in the proceedings as guaranteed by due process. They do not question the Commission's authority to proceed by informal rulemaking, as opposed to adjudication. They rely instead on the line of cases indicating that in particular circumstances procedures in excess of the bare minima prescribed by the Administrative Procedure Act, 5 U.S.C. § 553, may be required.[23]

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prior drafts of the Environmental Survey were eventually placed in the public document room. 39 Fed.Reg. 14190-91 (April 22, 1974).

None of these documents, however, dealt with the crucial waste disposal issues covered by Dr. Pittman, *see infra* pp. 23-32.

[23] *See, e.g.*, Mobil Oil Corp. v. FPC, 157 U.S.App.D.C. 235, 483 F.2d 1238, 1260 (1973); International Harvester Co. v. Ruckelshaus, 155 U.S.App.D.C. 411, 478 F.2d 615, 629-31, 649 (1973); Appalachian Power Co. v. EPA, 477 F.2d 495, 503 (4th Cir. 1973); Walter Holm & Co. v. Hardin, 145 U.S.App. D.C. 347, 449 F.2d 1009, 1016 (1971); American Airlines, Inc. v. CAB, 123 U.S.App.D.C. 310, 359 F.2d 624, 632-33 (en banc), *cert. denied*, 385 U.S. 843 (1966).

See also, Williams, *"Hybrid Rulemaking" under the Administrative Procedure Act: A Legal and Empirical Analysis*, 42 U.CHI.L.REV. 401 (1975); Wright, *Court of Appeals Review of Federal Regulatory Agency Rulemaking*, 26 ADMIN. L.REV. 199 (1974); Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L.REV. 375 (1974). Verkuil, *Judicial Review of Informal Rulemaking*, 60 VA.L.REV. 185, 234-49 (1974); Note, *The Judicial Role in Defining Procedural Requirements for Agency Rulemaking*, 87 HARV.L.REV. 782 (1974); Hamilton, *Procedures for the Adoption of Rules of General Applicability: The Need for Procedural Innovation in Administrative Rulemaking*, 60 CALIF.L.REV. 1276, 1313-30 (1972); Claggett, *Informal Action —Adjudication—Rulemaking: Some Recent Developments in Federal Administrative Law*, 1971 DUKE L.J. 51, 78.

The Government concedes that "basic considerations of fairness may under exceptional circumstances" require additional procedures in "legislative-type proceedings," but contends that the procedures here were more than adequate.[24] Thus, we are called upon to decide whether the procedures provided by the agency were sufficient to ventilate the issues.[25]

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[24] Respondent's brief at 13-14.

[25] We disagree with Intervenor Baltimore Gas & Electric Co.'s threshold objection that the public interest intervenors failed to make a proffer of the specific issues and witnesses which they claimed could not adequately be explored without cross-examination as required by International Harvester Co. v. Ruckelshaus, *supra* note 23, 478 F.2d at 630-31; *see also* American Airlines v. CAB, *supra* note 23, 359 F.2d at 632-33. The public-interest intervenors submitted a thorough legal brief demanding cross-examination and discovery rights. CNI-UCS Statement with Respect to Legal Considerations of the Proposed Regulations on the Nuclear Fuel Cycle, 20-29; II-J.A. 225, 245, 254. The first point made by Mr. Roisman, attorney for the public interest intervenors, in the oral hearings was a request to be allowed to go behind the reassurances offered by Dr. Pittman:

> The Atomic Energy Commission continues to take subjects as important as nuclear waste disposal and treat them in a cavalier manner that we find them treated in this environmental survey. They continue to raise the issues of the environmental [sic] fuel cycle in the most obtuse manner, and subject it to this type of a legislative hearing, while refusing to face up to the fact that the public demands the right to cross-examine and to have discovery on these issues, that we are not satisfied with Mr. Pittman's well intentioned, but, we think, not at all well explained position with regard to the ability to handle nuclear wastes for hundreds of thousands of years. He has in his own words referred to it as a program of perpetual management . . . . I think the public deserves the right to ask the question, What does that mean?

II-J.A. 121-22. That was sufficient to focus the agency's at-

A few general observations are in order concerning the role of a court in this area. Absent extraordinary circumstances, it is not proper for a reviewing court to prescribe the procedural format which an agency must use to explore a given set of issues.[26] Unless there are statutory directives to the contrary, an agency has discretion to select procedures which it deems best to compile a record illuminating the issues.[27] Courts are no more expert at fashioning administrative procedures than they are in

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tention on Dr. Pittman's testimony as in the category of "soft and sensitive subjects and witnesses." International Harvester, *supra*, 478 F.2d at 631. *See infra*, pp. 32-33.

To be sure, the public interest intervenors did not show that these issues could not be explored except through cross-examination; nor did they attempt such a showing. Their argument, as we understand it, is not that cross-examination was required *per se*, but that the procedures utilized by the Commission were in the aggregate inadequate sufficiently to ventilate the issues. They recognize, for example, that exploration of the underlying methodology of the Environmental Survey could have been facilitated by adequate discovery, as an alternative to cross-examination of the staff. *See* Petitioner's Brief, 13-15.

[26] The Supreme Court has recently cautioned against requiring an agency to use particular procedures on remand:

> At least in the absence of substantial justification for doing otherwise, a reviewing court may not, after determining that additional evidence is requisite for adequate review, proceed by dictating to the agency the methods, procedures, and time dimension of the needed inquiry and ordering the results to be reported to the court without opportunity for further consideration on the basis of the new evidence by the agency.

FPC v. Transcontinental Gas Pipe Line Corp., 96 S.Ct. 579, 583 (1976) (per curiam) [footnote omitted].

[27] *See* NLRB v. Bell Aerospace Co., 416 U.S. 267, 292-95 (1974); SEC v. Chenery Corp., 332 U.S. 194, 203 (1947) (Chenery II); Siegel v. AEC, 400 F.2d 778, 783 (D.C.Cir. 1968).

the substantive areas of responsibility which are left to agency discretion.[28] What a reviewing court can do, however, is scrutinize the record as a whole to insure that genuine opportunities to participate in a meaningful way were provided, and that the agency has taken a good, hard look at the major questions before it.

We have sometimes suggested that elucidation of certain types of issues, by their very nature, might require particular procedures, including cross-examination.[29] In fact, we have been more concerned with making sure that the record developed by agency procedures discloses a thorough ventilation of the issues than with what devices the agency used to create the dialogue.[30]

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[28] That may be reflected in the finding that in most cases where the right to cross-examination was won on appeal, it was not actually used on remand, the parties instead agreeing on more flexible procedures such as written memoranda explaining technical methodology or informal staff conferences which better suited their needs. *See* Williams, *supra* note 23, 42 U.CHI.L.REV. at 436-37; 448-54.

[29] *See, e.g.*, International Harvester v. Ruckelshaus, *supra* note 23, 478 F.2d at 631 ("soft and sensitive subjects and witnesses"); *but cf.* O'Donnell v. Shaffer, 160 U.S.App.D.C. 266, 491 F.2d 59, 62 (1974) (Bazelon, C.J.): "the presence of technical issues in and of itself [does not] create a need for cross-examination."

[30] *See, e.g.*, Walter Holm & Co. v. Hardin, *supra* note 23, 449 F.2d at 849: "What counts is the reality of an opportunity to submit an effective presentation, to assure that the Secretary and his assistant will take a hard look at the problems in light of those submissions."; International Harvester v. Ruckelshaus, *supra* note 23, 478 F.2d at 631: "There was a meaningful opportunity to be heard. . . . The record reveals that the hearing officers did not propound the pre-submitted questions like robots; they were charged with conducting a hearing for the purpose of focusing information needed for decision and they quite appropriately 'followed up' on questions."; O'Donnell v. Shaffer, *supra* note 23, 491 F.2d at 62: "Here the agency's proceedings provided an adequate oppor-

Of necessity, assessing agency procedures requires that the reviewing court immerse itself in the record. Abstract characterizations are an unsatisfactory guide for determining what procedures are necessary in particular proceedings.[31] Alternative procedural techniques are usually available, and the absence of one device, such as cross-examination, may be compensated for by the sensitive use

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tunity for the airing of technical disputes. Appellants presented their evidence orally and in writing and questioned a supporter of the rule who testified at the hearing. The agency considered the evidence presented at the hearing in its 'Disposition of Petition.' On these facts, the procedures were adequate for the task at hand."; Ethyl Corp. v. EPA, No. 73-2205 (D.C.Cir., March 19, 1976) (en banc) (opinion of Wright, J.), slip op., 119-22, —— F.2d ——, ——, *cert. denied*, 44 U.S.L.W. 3719 (June 10, 1976), reviewing in detail the procedures used and the agency's lengthy opinion and concluding: "The complex scientific questions presented by this rulemaking proceeding were resolved in the crucible of debate through the clash of informed but opposing scientific and technological viewpoints." [Citation omitted.]

[31] *See* Wright, *supra* note 23, 26 ADMIN.L.REV. at 206-7; *id.*, 59 CORNELL L.REV. at 387-88.

Judge Tamm professes surprise that one who believes judges must avoid making "plausible-sounding, but simplistic, judgments of the relative weight to be afforded various pieces of technical data," Ethyl Corp. v. EPA, *supra* note 30 (Bazelon, C.J., concurring), slip op., 2, nonetheless believes review of agency procedures requires conscientious attention to the state of the record. Concur, n. 7.

There is, however, a difference crucial to the institutional competency of judges between the majority opinion here and the panel opinion, joined by Judge Tamm, which was overturned by the court *en banc* in *Ethyl*. The panel in *Ethyl* took it upon itself to decide that an expert agency had made "clear errors of judgment" in evaluating conflicting scientific studies. Slip op., 48. Here we merely systematically catalog the state of the record to verify that the agency has digested and addressed the major issues.

of substitutes.[32] If review is to be meaningful, it must focus on the actual operation of the whole range of procedures in a particular setting—including "contexts of fact, statutory framework, and nature of action." [33]

A prominent feature of the statutory context created by NEPA is the requirement that the agency acknowledge and consider "responsible scientific opinion concerning possible adverse environmental effects" which is contrary to the official agency position. (*see, e.g., infra* note 51). *Committee for Nuclear Responsibility, Inc.* v. *Seaborg*, 463 F.2d 783, 787 (D.C. Cir. 1971). NEPA requires that agencies see to it that "the officials making the ultimate decision [are] informed of the full range of responsible opinion on the environmental effects in order to make an informed choice." *Id.* The decision to proceed by rulemaking neither relieves the Commission of this obligation, nor permits it to depend solely on whatever contributions intervenors happen to make to develop a fair representation of scientific opinion for the record.[34]

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[32] *See* International Harvester v. Ruckelshaus, *supra* note 23, 478 F.2d at 631.

[33] Kennecott Copper Corp. v. EPA, 149 U.S.App.D.C. 231, 235, 462 F.2d 846, 850 (1972).

[34] At least in the NEPA context, an agency has an affirmative obligation to explore the issues in depth, rather than wait passively until an intervenor takes the initiative. *See* Calvert Cliffs' Coordinating Comm. v. AEC, *supra* note 14, 449 F.2d at 1118-19. There the Commission proposed to limit consideration to environmental issues "which parties affirmatively raise." The court held that was inconsistent with NEPA's "basic mandate":

> The primary responsibility for fulfilling that mandate lies with the Commission. Its responsibility is not simply to sit back, like an umpire, and resolve adversary contentions at the hearing stage. Rather, it must take the initiative. . . .

See also Scenic Hudson Preservation Conference v. FPC, 354 F.2d 608, 620-21 (2d Cir. 1965), *cert. denied*, 384 U.S. 941

In order to determine whether an agency has lived up to these responsibilities, a reviewing court must examine the record in detail to determine that a real give and take was fostered on the key issues. This does not give the court a license to judge for itself how much weight should be given particular pieces of scientific or technical data, a task for which it is singularly ill-suited. It does require, however, that the court examine the record so that it may satisfy itself that the decision was based "on a consideration of the relevant factors." [35] Where only one side of a controversial issue is developed in any detail, the agency may abuse its discretion by deciding the issues on an inadequate record.

A reviewing court must assure itself not only that a diversity of informed opinion was heard, but that it was genuinely considered. "[T]he dialogue that the APA's rulemaking section contemplates cannot be a sham." [36] Since a reviewing court is incapable of making a penetrating analysis of highly scientific or technical subject matter on its own, it must depend on the agency's ex-

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(1966) (agency duty to develop full record grounded on broad principles of administrative law); Note, *supra* note 17, 61 VA.L.REV. at 891: "when the record is deficient, the Commission may even have a duty to consider issues ignored by the parties."

In both *Calvert Cliffs* and *Scenic Hudson*, the court pointed out that poorly-financed public interest intervenors may lack the wherewithal to marshal technical evidence and bring it to the Commission's attention. *See also* American Public Power Ass'n v. FPC, 522 F.2d 142, 147 (D.C.Cir. 1975) (Bazelon, C.J., concurring); Citizens for Safe Power v. NRC, 524 F.2d 1291, 1304 (D.C.Cir. 1975) (Bazelon, C.J., concurring).

[35] Citizens to Preserve Overton Park, Inc. v. Volpe, 401 U.S. 402, 416 (1971). *Cf.* Ethyl Corp. v. EPA, *supra* note 30 (Bazelon, C.J., concurring), slip op., 2 n.7.

[36] Wright, *supra* note 23, 26 ADMIN.L.REV. at 206.

pertise, as reflected in the statement of basis and purpose, to organize the record, to distill the major issues which were ventilated and to articulate its reasoning with regard to each of them.[37]

An agency need not respond to frivolous or repetitive comment it receives. However, where apparently significant information has been brought to its attention, or substantial issues of policy or gaps in its reasoning raised, the statement of basis and purpose must indicate why the agency decided the criticisms were invalid.[38] Boilerplate generalities brushing aside detailed criticism on the basis of agency "judgment" or "expertise" avail nothing; what is required is a reasoned response, in which the agency points to particulars in the record which, when coupled with its reservoir of expertise, support its resolution of the controversy.[39] An agency may abuse its discretion by proceeding to a decision which the record before it will not sustain, in the sense that it raises fundamental questions for which the agency has adduced no reasoned answers.

(B.)

With these observations in mind, we turn to our examination of this record. The significance of Table S-3 is that it expresses in numerical terms the conclusion that the environmental effects of the fuel cycle, including waste

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[37] *See* Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 393-95 (D.C.Cir. 1973), *cert. denied*, 417 U.S. 921 (1974); *cf.* Automotive Parts & Accessories Ass'n v. Boyd, 407 F.2d 330, 338 (D.C.Cir. 1968) (statement of basis and purpose must be explicit enough to allow court "to see what major issues of policy were ventilated by the informal proceedings and why the agency reacted to them as it did").

[38] Portland Cement Ass'n v. Ruckelshaus, *supra* note 37, 486 F.2d at 393-94.

[39] *See* Wright, *supra* note 23, 26 ADMIN.L.REV. at 209-210.

disposal, are insubstantial.[40] The primary basis for these judgments is the data assembled by the staff in the draft Environmental Survey made public with the proposed rule. The conclusions reached by the staff in the Environmental Survey were in turn adopted without modification by the Commission as Table S-3 and embodied in the final rule. Thus, support for a rule limiting consideration of environmental issues to the numbers in Table S-3 must be found in one of three places: the Environmental Survey, the back-up documentation to which it refers, and the oral and written testimony offered at the hearing. It is to these sources we must look for a thorough ventilation of the underlying issues.

The Environmental Survey made public prior to the hearing was intended to "provide[] a basis for an informed consideration of the . . . environmental impact associated with the uranium fuel cycle . . . [and to] contain[] extensive references to background documents available to members of the public." 38 Fed.Reg. 49 (Jan. 3, 1973). Regarding most phases of the fuel cycle, these promises were fulfilled and the Environmental Survey did an adequate, even admirable job, of describing the processes involved. It assembles data on the consumption of resources, and discusses the risks of accidents and other hazards in detail, supporting the staff's conclusions with numerous references to the scholarly literature and to technical reports on file with the Commission. However, with regard to the two phases of the fuel cycle which are the focal points for this appeal, reprocessing and waste disposal,[41] that kind of detailed explanation

[40] *See supra* note 19.

[41] In a general way, "reprocessing" is that phase of the fuel cycle in which reusuable portions of spent fuel are extracted for recycling and the remaining radioactive residues are concentrated. "Waste disposal," a misnomer for what is more appropriately termed "waste storage and management," refers to containment of wastes during the long periods necessary for them to decay naturally into non-toxic substances. *See supra* note 3.

and support for the staff's conclusions was noticeably absent from the Environmental Survey as originally published.

The only discussion of high-level waste disposal techniques was supplied by a 20-page statement by Dr. Frank K. Pittman, Director of the AEC's Division of Waste Management and Transportation. This statement, delivered during the oral hearings, was then incorporated, often verbatim, into the revised version of the Environmental Survey published after the comment period.[42] Dr. Pittman began his statement by acknowledging that he was "broadly involved" with the subject of high-level waste management since he heads the division of the AEC charged with "responsibility for the development, construction and operation of facilities for ultimate management of commercial high-level waste." [43]

Dr. Pittman proceeded to describe for the first time in public the "design concepts" for a federal surface reposi-

[42] *See* "Environmental Survey of the Uranium Fuel Cycle" (April, 1974) (hereafter "Revised Environmental Survey") G-23 n.18, II-J.A. 740.

For example, the discussion of the possibility of accidental release of wastes as a result of loss of coolant at *id.*, G-19-21, II-J.A. 736-737, is taken verbatim from Dr. Pittman's statement.

[43] II-J.A. 59. In Portland Cement Ass'n v. Ruckelshaus, *supra* note 37, 486 F.2d at 400 n.95, the court pointed out that where a "principal source of reliance by the agency" was "peculiarly subject to considerations of self-interest, more might be required than mere comments." Evaluation of a program by the in-house staff member charged with the responsibility for administering it falls within the intendment of that statement.

tory for retriveable storage of high-level waste.[44] This is essentially a warehouse in which sealed canisters containing cylinders of solidified nuclear wastes can be stored in water-filled basins recessed into the ground on a temporary basis (up to 100 years), until such time as a permanent waste disposal scheme is devised, when they can be removed.[45] While the "intended life" of the facility is only 100 years, some high-level wastes must be isolated for up to 250,000 years. *See supra* p. 7. Therefore, the Environmental Survey states, without further explanation, that in the future a "permanent" Federal repository for "geologic storage of high-level wastes" will be established and that the "Federal government will have the obligation to maintain control over the site *in perpetuity*." II-J.A. 724 [emphasis added].

Until recently the AEC planned to dispose of wastes by burying them deep inside abandoned salt mines. These plans were postponed indefinitely after a series of tech-

[44] The staff subsequently described the significance of Dr. Pittman's testimony as follows:

> When the [Environmental Survey] was published in November 1972, the data on the proposed Federal Repository for high level waste storage were limited to preliminary criteria and generalized statements. . . . The information in Dr. Pittman's statement is the first public release of the preliminary concepts for the Federal Repository and provides a summary of the current status and potential environmental effects of the high level waste interim storage facility and further AEC plans for longer term storage. The information from his testimony will be incorporated in the revised edition of the [Environmental Survey]. . . . The additional data presented by Dr. Pittman show that the interim high-level waste repository will be designed to have little environmental impact.

"Additional Information on Environmental Effects of the Uranium Fuel Cycle," II-J.A. 355-56.

[45] *See* Revised Environmental Survey, G-7, II-J.A. 724.

nical difficulties, including the discovery the salt mines might be susceptible to underground flooding. The Revised Environmental Survey devotes two sentences to recounting how prior waste disposal plans fared:

> It was planned to construct a Federal repository in a salt mine for long-term geological storage of solid high-level wastes by the mid 1970's. However, subsequent events have deferred the site selection and construction of such a facility.

II-J.A. 724. The "subsequent events" which led to the shelving of the salt mine plan are not discussed.[46]

[46] The difficulties encountered regarding the primary site considered, salt beds near Lyons, Kansas, have recently been summarized as follows:

> Although that site had been under consideration for many years by the [AEC], it was not until 1971 that the commission and its contractors discovered two major problems with it. One was a series of abandoned gas and oil drill holes in the area. Another was an adjacent salt mine's extensive use of water to dissolve out the salt—including a hydraulic fracturing technique which had resulted in the disappearance underground of some 175,000 gallons of water. Both discoveries cast doubt on the long-term safety and integrity of the proposed Lyons site, since it appeared possible that water might penetrate the area and allow radioactive wastes to escape.

Boffey, "Radioactive Waste Site Search Gets Into Deep Water," 190 SCIENCE 361 (Oct. 24, 1975).

After the planned site near Lyons, Kansas was abandoned, attention focused on salt beds in southeastern New Mexico. Unexpected problems have recently been encountered at this site, too. A test hole hit a large underground pocket of brine and explosive gases. Not only would the presence of these gases threaten the safety of workers at any facility, but a "second disturbing aspect is that the presence of the brine solution may indicate that fluids have been migrating underground, thereby threatening the integrity of the site." *Id.* As the result, the search for a suitable site has been moved once again, this time to an area several miles away.

Dr. Pittman's description of the new plan—now also postponed indefinitely [47]—to build a surface storage facility can only fairly be described as vague, but glowing. He begins:

> . . . I hope I will be able to allay what I feel are unwarranted fears . . . and show that the bugaboo of waste management cannot logically be used as a rationale for delays in the progress of an essential technology for meeting our growing power demands.
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> [T]here are available today proven methods for managing the high-level waste from the nuclear industry in a way which will assure first that man will not be adversely affected by the radioactivity either by external or internal contact with the waste itself or by exposure to the penetrating radiation which it generates, and second that the environment [sic] effects will be very small.

II-J.A. 59-60. In less than two pages, he set out a very general description of what the facility is supposed to do, II-J.A. 63-66, accompanied by several schematic drawings. These show the facility will have a cooling system, a transfer area and storage basins, but do not attempt to describe how they will be built and operated, what materials will be used, where such a facility might be located, or what it might cost to build and operate.

[47] By letter dated April 9, 1975, the Administrator of ERDA informed the Congressional Joint Committee on Atomic Energy that preliminary funding for a Retrievable Surface Storage Facility was being deleted from the fiscal 1976 budget request pending a "comprehensive reevaluation of the federal program in this critical and controversial area." *See* "ERDA Shelves a Nuclear Waste Storage Plan," 188 SCIENCE 345 (April 25, 1975).

As part of that review, we understand revised impact statements are being prepared concerning reprocessing and waste disposal. As those matters are not before us, we intimate no opinion regarding the extent to which they may cure the deficiencies in the present proceeding.

Recent Congressional testimony by ERDA officials indicates a return to the plan to bury wastes, although no site has been finally chosen. "Salt, Rock Formations Favored for A-Wastes," *Washington Post*, May 11, 1976, A-2, cols. 1-3.

Dr. Pittman then explains that "the major factor in the design of the repository for high-level waste is the technique used to remove the heat from the waste." II-J.A. 63. Decaying radioactive waste spontaneously gives off substantial heat and "[s]hould adequate provisions not be made to remove this heat . . ., the waste and the canister would melt." *Id.* A "meltdown" would result in what Dr. Pittman calls a "situation of considerable concern," which would involve the "loss of some fraction of the isolation of the radioactive material from the environment." II-J.A. 65. No attempt is made to describe how serious a radioactivity hazard would be presented.

In a paragraph which is carried over verbatim in the Revised Environmental Survey, II-J.A. 726, Pittman states:

> The Commission has carried out extensive evaluations of safety, reliability, operability, maintainability and economics of various methods for removing heat, and has essentially narrowed the area for further study to techniques using either water or air as the heat transfer medium.

II-J.A. 64. No citations are given for these studies; in fact, there are no references to back-up materials supporting any of Pittman's statement, or those portions of the Revised Environmental Survey drawn from it.[48]

[48] Following Dr. Pittman's presentation one of the presiding board members remarked:

> . . . one of the, I think, outstanding practices of the Staff has been in the past, at least as far as I can tell,

Again without benefit of details, Dr. Pittman offers conclusory reassurances that the proposed facility will be designed so that the possibility of a "meltdown" can be dismissed as "incredible":

> The probability of this situation occurring is prevented by a combination of engineered features including, (i) redundancy of power supply and other essential cooling systems; (ii) structural strength to withstand credible forces of nature—earthquake, tornado, etc.; (iii) combination of structural strength, plant security, etc., to withstand credible overt forces of man; (iv) modular basin cell construction which limits the number of canisters subject to a single catastrophic event.

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to meticulously document the assumptions that are made in the discussions. I find that that has not been done here. . . . I guess I must assume that one of the reasons that those assumptions have not been documented and clarified or justified in the purest sense of the word, is because of the time schedule required to get this thing on so we could get to hearings. Can it be assumed that if there is going to be a significant revision to this document that in those areas where assumptions are made, particularly where there is a statement to the effect that something is trivial, or insignificant, that somewhere there will appear in that same document some kind of justification based on data or a reference which one can go back to and find the source.

II-J.A. 116-17.

A staff member assured the questioner "[w]e will make every effort to go back and see if we can improve that," II-J.A. 118, and subsequently the staff submitted a 56 page document of "Additional Information on Environmental Effects of the Uranium Fuel Cycle," II-J.A. 352. However, less than two pages are devoted to the waste disposal issues addressed by Dr. Pittman, and these merely correct four minor numerical and typographical errors or omissions in his testimony. *See* II-J.A. 402-03. Nor does the Revised Environmental Survey fill in the gaps in Dr. Pittman's testimony.

> Thus, before a meltdown could occur, it would be necessary to have a series of failures of systems which will be engineered, constructed, and operated for maximum reliability under rigorous quality assurance programs before a situation could occur where sufficient water could not be added to and maintained in the cell to keep it from leaking or boiling dry. The timing for such a series of failures to result in uncorrectable situations is important. The individual failure of power systems for circulating the coolant would not result in pool water boiling for at least 16 hours. Various corrective actions may be taken any time within a week which would prevent cell water from boiling away. After the complete loss of water, an additional day would be required before the waste would begin to melt. The number of sequential failures required of highly reliable systems, combined with the long time periods available for repair and recovery from each, result in the judgment that this is an incredible incident.

II-J.A. 65-66. His unadorned conclusion is in turn incorporated verbatim into the Revised Environmental Survey.[49]

Other than the broad reference to "structural strength, plant security, etc., to withstand credible overt forces of man", there is no discussion of how the facility would be protected from terrorism.[50] While Dr. Pittman says

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[49] *See* "Environmental Survey of the Uranium Fuel Cycle" (April, 1974) G-19-20, II-J.A. 736-737.

[50] When Dr. Henry Kendall, an expert witness for Consolidated National Intervenors, tried to raise the risks of terrorism, he met the following reception from the chairman of the hearing board:

> I have just one question . . . with regard to nuclear blackmail and the potential terrorist activities. What I am a little puzzled about is its relevance . . . . I say this with all due respect, Dr. Kendall; I guess those words are

"[v]arious corrective actions" might be taken to prevent a meltdown, none are specified.

Dr. Pittman concludes with the judgments that:

> . . . (1) the program being followed by the industry under AEC regulation and by the AEC offers assurance that the commercial high-level waste will be managed safely from its initial production; (2) the surface storage method, to be used by the AEC, is good for as long as adequate human surveillance and maintenance effort is continued; (3) the probability that work currently under way will demonstrate the use of bedded salt as a safe, acceptable, ultimate disposal method within the next ten to fifteen years is very high; (4) should bedded salt not prove to be acceptable, other acceptable geologic disposal concepts offer reasonable probability of reaching a point of acceptability within two or three decades; and (5) the waste in initial storage will be easily retrievable for either near- or far-term disposal methods when they are developed.

II-J.A. 82. There is no discussion of how "adequate human surveillance and maintenance" can be assured for the periods involved, nor what the long-term costs of such a commitment are, nor of the dangers if surveillance is not maintained.[51] Nor is any explanation offered for Dr. Pittman's optimism regarding bedded salt as a disposal method, since the problems which have surfaced and delayed that program are not mentioned.[52] Nor does the statement anywhere describe what "other

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> exciting reading in the newspapers, but I would like to have [you] indicate the relevance between the responsibilities of the Atomic Energy Commission under the National Environmental Protection Act [sic] in these respects as against, at least, what I read to be the subject matter of your comments in this particular wise, and that is the military and potential security aspects of the transportation of nuclear materials. Do I make myself clear?

An attorney for the intervenors then explained that NEPA requires consideration of more than the "simplistic questions" of "how many fish will get hurt. . . ." The chairman responded:

> You see then, forgive me for using the word, a fusion somehow between what is known as, I understand, the impact on the environment as against the political and military security?

[Attorney]:

> Of course, what is precisely involved in political and military security is that someone threatens to do a heck of a lot of damage to the environment in exchange for something they want.

II-J.A. 213-16.

[51] A subsequent report to the Administrator of ERDA by a four-man task force, including Dr. Pittman, reflects a much less rosy assessment of the problems of reprocessing and waste disposal. NUCLEAR FUEL CYCLE: A REPORT OF THE FUEL CYCLE TASK FORCE, ERDA-33 (March, 1975).

The unanimous task force concluded, *inter alia*, "there are still many technical problems and uncertainties in the overall area of processing of spent fuel and properly managing its radioactive waste", *id.*, 40; "[t]he costs of storage and ultimate disposal . . . are very much higher than had previously been assumed . . . .", *id.*, 46; "[the public] fear[s] that the radioactive waste generated . . . will either be neglected, and thus place an unacceptable hazard potential on mankind, or be managed in a way that will place an unacceptable burden on future generations to assure continued public safety. [T]hese . . . fears . . . are supported by a fair segment of the scientific community—many of whom otherwise support the use of nuclear reactors for generation of electric power", *id.*, 49-50.

[52] *See supra* note 46. Contrary to Dr. Pittman's unexplained optimism, an article in SCIENCE recently termed finding a site for long-term disposal of radioactive wastes "one of the key unresolved problems of the nuclear era." Boffey, *supra* note 46, 190 SCIENCE 361 (Oct. 24, 1975).

acceptable geogologic disposal concepts" are under consideration.

When Dr. Pittman finished, no questions were put to him by the hearing board.[53] No cross-examination was permitted.

Based on Dr. Pittman's statement, the Revised Environmental Survey concludes that the resources consumed in waste storage will be minimal, that "under normal conditions" no radioactivity will be released and that the possibility of a serious accident is "incredible." [54] In short, based on the information in Dr. Pittman's statement, the Commission concluded that the future environmental effects from the disposal of high-level nuclear wastes are negligible. This conclusion is in turn embodied in Table S-3, and further consideration of the issue terminated.

We do not dispute these conclusions. We may not uphold them, however, lacking a thorough explanation and a meaningful opportunity to challenge the judgments underlying them. Our duty is to insure that the reasoning on which such judgments depend, and the data supporting them, are spread out in detail on the public record. Society must depend largely on oversight by the technically-trained members of the agency and the scientific community at large to monitor technical decisions. The problem with the conclusory quality of Dr. Pittman's statement—and the complete absence of any probing of its underlying basis—is that it frustrates oversight by anyone: Commission, intervenors, court, legislature or public. Given the opportunity, Dr. Pittman might have provided convincing answers to many of the questions which his statement leaves untouched. Since that did not occur, however, his judgments must either be accepted at face value, or rejected out of hand.

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[53] One short comment was made concerning commercial disposal of low-level waste, II-J.A. 115, as was the observation, quoted *supra* note 48, regarding failure to provide back-up documentation.

The board's quiescence regarding Dr. Pittman is in marked contrast to its often hostile questioning of expert witnesses for the intervenors. *See, e.g., supra* note 50.

[54] Revised Environmental Survey, *supra* note 42, G-2-G-3, II-J.A. 719-720.

Although the vagueness of the presentation regarding waste disposal made detailed criticism of its specifics impossible, *see* II-J.A. 257, the public interest intervenors did offer a number of more general comments concerning the Commission's approach. They criticized the Commission for a general "failure to distinguish between design objectives on the one hand and performance on the other," II-J.A. 124, noting that no consideration had been given actual experience with storage of wastes generated by weapons production. II-J.A. 272-74. They also questioned confident assertions by the AEC that long-term waste management is feasible, laying particular stress on the immense time periods involved which mock human institutions:

> Except for the storage of liquid wastes in tanks, for which experience from weapons production applies, all proposals for long term storage or disposal of high level waste from the nuclear power industry lie at the research and development stage.
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> * * * *
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> The impression is inescapable, in view of the present imprecise state of affairs, that no convincing statements exist regarding the long term environmental impact attending the storage and/or disposal of wastes from fuel reprocessing.
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> * * * *
>
> The times during which radioactive wastes must remain secure from the biosphere have no parallel

> in human affairs. Eight hundred years are required for fission products alone and millions of years if the fission products continue to be contaminated with transuranic elements at present levels. Fission technology requires that man issue guarantees on events far into the future, and it is not clear in most cases how this can be done. Institutional arrangements do not exist and never have existed to guarantee the monitoring of or attendance upon storage facilities over a millennium. In the range of a million years, serious geological uncertainties arise and even the survival of man may be doubtful. "In perpetuity" has little real meaning in human affairs.

II-J.A. 261-2. They reiterated repeatedly that the problems involved are not merely technical, but involve basic philosophical issues concerning man's ability to make commitments which will require stable social structures for unprecedented periods.[55]

The intervenors pointed out that storing wastes aboveground places a premium on stable human institutions for monitoring and surveillance, II-J.A. 275-76; that until plans for long-term disposal in the salt beds at Lyons, Kansas fell through, *see supra* note 46, the agency had itself rejected the idea of surface storage because of the surveillance problems. II-J.A. 210-11, 287-89.

After reviewing the record, the presiding hearing board isolated several areas of controversy which it felt ought to be addressed by the Commission in issuing the proposed rule. Included were the adequacy of the discus-

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[55] II-J.A. 275-76. An illuminating perspective is provided in D. Farney, *Ominous Problem: What to Do with Radioactive Waste*, 5 SMITHSONIAN MAG. 20, —— (1974):

> The entire recorded history of mankind is but a fraction of the 250,000-year storage time of plutonium. Neanderthal man appeared only about 75,000 years ago.

sion of waste disposal systems,[56] and the need for fuller background documentation. II-J.A. 498.

The Commission disposed of these issues summarily in its statement of basis and purpose accompanying the promulgation of the rule without attempting to articulate responses to any of the points which had been raised regarding waste disposal:

> Considerable information was presented at the hearing on high level waste storage utilizing a retrievable surface storage facility. A description was given of such facility, the normal radiological effluents, and a maximum credible accident.
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> * * * *
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> While such a waste storage facility has not been constructed, preliminary conceptual designs have been developed using existing technology based on well established data and techniques.

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[56] The presiding board wrote:

> At the time the Environmental Survey was issued for public comment in the Rulemaking Proceeding, together with the proposed amendments to the Rules, the Survey did not contain data with regard to proposed waste disposal systems. During the course of the oral presentation, the Regulatory Staff offered for the record an extensive presentation by Dr. Frank Pittman regarding various methods for waste disposal which were in the planning stage, and, based upon such planning, assigned various values regarding assumed environmental impact of such waste storage facilities. It was argued that, in all other respects, the Survey dealt with the environmental impact of actual and existing facilities; but that, with respect to waste disposal, the Survey was unreliable in that it dealt with non-existent facilities; . . . .

Ii-J.A. 490.

While this is not an entirely accurate synopsis of the intervenor's position as set out above, it focused the Commission's attention on this aspect of the proceedings.

> The Commission believes that the Survey and hearing record provide an adequate data base for the regulation adopted.

39 Fed.Reg. 14189 (April 22, 1974); II-J.A. 507.1 [unnumbered page following 507].[57] Thus, to the limited extent that any give-and-take was fostered on the nuclear waste issues, the Commission, in its final decision, failed to address major contentions that were raised.

(C.)

In substantial part, the materials uncritically relied on by the Commission in promulgating this rule consist of extremely vague assurances by agency personnel that problems as yet unsolved will be solved. That is an insufficient record to sustain a rule limiting consideration of the environmental effects of nuclear waste disposal to the numerical values in Table S-3. To the extent that uncertainties necessarily underlie predictions of this importance on the frontiers of science and technology, there is a concomitant necessity to confront and explore fully the depth and consequences of

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[57] We note that the Commission also promised to undertake "a more definitive assessment" of the environmental effects of waste storage as more information becomes available through subsequent environmental impact statements. 39 Fed. Reg. 14190 (April 22, 1974); II-J.A. 508.

While that is praiseworthy as an acknowledgment of the Commission's responsibility to reassess its actions in the light of later information, it cannot be used as a bootstrap to excuse the present rule cutting off further consideration in licensing proceedings.

We have already held in *Vermont Yankee, supra* p. 8, that the Commission may not refuse to consider the environmental effects of waste disposal when it licenses an individual reactor simply by promising to consider them later when it licenses facilities for waste disposal. We see no reason why that principle applies with any less force to accomplishing the same result through rulemaking.

such uncertainties. Not only were the generalities relied on in this case not subject to rigorous probing—in any form—but when apparently substantial criticisms were brought to the Commission's attention, it simply ignored them, or brushed them aside without answer. Without a thorough exploration of the problems involved in waste disposal, including past mistakes, and a forthright assessment of the uncertainties and differences in expert opinion, this type of agency action cannot pass muster as reasoned decisionmaking.[58].

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[58] We reject the contention that Table S-3 is itself a "major Federal action" requiring an environmental impact statement. The Commission characterized this rulemaking as merely addressing "a procedural question involving the implementation of NEPA . . . ." 39 Fed.Reg. 14188. *Cf.* Gage v. AEC, 479 F.2d 1214, 1222 n.26 (D.C.Cir. 1973). Petitioners, however, claim Table S-3 has "substantive" effect, since it establishes values for environmental effects on which subsequent licensing decisions may turn. Reply brief at 12. While we agree that Table S-3 may have important decisional consequences by implying that fuel cycle problems are manageable, in the circumstances presented here, we do not believe these implications ripen into a proposal for agency action until they are incorporated into individual licensing decisions. *Compare* Aberdeen & Rockfish R.C. v. SCRAP, 422 U.S. 289, 320 (1975) *with* SIPI, *supra* note 11, *and* Sierra Club v. Morton, 514 F.2d 856 (D.C.Cir. 1975), *rev'd sub nom.* Kleppe v. Sierra Club, 44 U.S.L.W. 5104 (U.S., June 28, 1976). At that point an impact statement will be prepared with regard to the licensing decision. We do not read the statute as requiring more.

Petitioners also argue that Table S-3 violates NEPA because it is incomprehensible to "non-technical minds." Environmental Defense Fund v. Corp of Engineers, 348 F.Supp. 916, 933 (W.D. Miss.), *aff'd.*, 492 F.2d 1123 (5th Cir. 1972). We do not reach that issue. The defects, if any, may be cured by fuller explanation in a revised statement of basis and purpose, or in subsequent NEPA statements incorporating Table S-3.

[Continued]

Many procedural devices for creating a genuine dialogue on these issues were available to the agency—including informal conferences between intervenors and staff, document discovery, interrogatories, technical advisory committees comprised of outside experts with differing perspectives, limited cross-examination, funding independent research by intervenors, detailed annotation of technical reports, surveys of existing literature, memoranda explaining methodology. We do not presume to intrude on the agency's province by dictating to it which, if any, of these devices it must adopt to flesh out the record. It may be that no combination of the procedures mentioned above will prove adequate, and the agency will be required to develop new procedures to accomplish the innovative task of implementing NEPA through rulemaking. On the other hand, the procedures the agency adopted in this case, if administered in a more sensitive, deliberate manner, might suffice.[59] Whatever techniques

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[58] [Continued]

Finally, we reject the related argument that plenary consideration of alternatives was necessary in this proceeding. We agree with the Commission that this may be deferred until action is proposed to license particular disposal facilities. For purposes of this proceeding, provided a sufficiently conservative and credible assessment of a particular waste disposal method is used, it is not material that another method might turn out to be even more desirable. *See supra* note 13. Of course, we do not exclude the possibility that limited consideration of certain alternatives (*e.g.*, the consequences of not proceeding at all) may be necessary to meaningful judgments in a proceeding such as the present.

[59] Agencies are always free to adopt "hybrid procedures" beyond the minima prescribed by 5 U.S.C. § 553, and commonly do. United States v. Florida East Coast Ry., 410 U.S. 224, 236 n.10 (1973). In this case, the Commission elected to provide certain hybrid procedures in addition to those required by § 553—oral hearings and questioning by a presiding board. By listing other techniques, *supra* p. 39, which might aid the Commission in compiling an adequate record, we do not intimate that it must adopt any of them. What is of

the Commission adopts, before it promulgates a rule limiting further consideration of waste disposal and reprocessing issues, it must in one way or another generate a record in which the factual issues are fully developed.

Our colleague, concurring specially, expresses the view that there is "little to be gained other than delay" by remanding for additional proceedings, since it is "almost inevitable" that the Commission will reach the same result "after fully considering the problems and alternative methods of waste disposal."[60] Even if true, that would only supply an additional reason to require the Commission to acknowledge the risks and problems, as well as lay bare its own reasoning. Agencies are less likely

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concern to us is that the record after remand disclose a thorough ventilation of the issues.

On paper, the procedures used to supplement § 553 here were virtually identical to those approved by the court in International Harvester v. Ruckelshaus, *supra* note 23, 478 F.2d at 631, in which oral statements were allowed and the hearing board was authorized to ask questions submitted by the parties. However, in practice the procedures were administered quite differently in *International Harvester:* "[T]he hearing officers did not propound the pre-submitted questions like robots; they were charged with conducting a hearing for the purpose of focusing information needed for decision and they quite appropriately 'followed up' on questions." *Id.* In this case the board members asked no questions whatsoever of Dr. Pittman. *See supra* note 53.

[60] Concur at 5. According to Judge Tamm, on remand "the Commission may or may not adopt one of the majority's [procedural] suggestions, but will in any case seek to comply by mechanically generating more 'negative' information respecting current problems with disposal of high level radioactive wastes and then will 'overcome' this information with citations to favorable studies and articles." *Id.*, 4.

Stripped of rhetoric, this means that the Commission may reach the same result on an adequate record—which, of course, is why we remand rather than reverse.

to persist in the face of information publicly exposing the fallacies, if any, in their position. In any event, NEPA does not guarantee a particular outcome on the merits; rather, the statute mandates only a "careful and informed decisionmaking process" to enlighten the decisionmaker and the public.[61] In the rulemaking context, that requires the Commission to identify and address information contrary to its own position, to articulate its reasoning and to specify the evidene on which it relies.[62] The Commission may well reach the same conclusion on remand. But if it does so on such a record, the Congress, the courts, and the public will all know where we stand.

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[61] *See* Calvert Cliffs' Coordinating Comm. v. AEC, *supra* note 14, 449 F.2d at 1115. *See also,* Comm. for Nuclear Responsibility, Inc. v. Seaborg, *supra,* 463 F.2d at 787; NRDC v. Morton, *supra* note 15, 458 F.2d at 833.

[62] Evidently Judge Tamm would permit Dr. Pittman to supplement his testimony without giving those who disagree an opportunity to criticize or comment on the new material (*e.g.*, "without reopening the oral proceeding," Concur at 3). We would not agree.

Unlike explanation of the *Commission's* rationale, Dr. Pittman's testimony is part of the evidentiary support underlying the proposed rule. *Cf.* Concur at 7. Both rudimentary procedural fairness and § 553 require that the evidentiary "basis" for a proposed rule be subject to public scrutiny and comment. *See* Portland Cement Ass'n v. Ruckelshaus, *supra* note 37, 486 F.2d at 393 n.67; Mobil Oil Corp. v. FPC, *supra* note 23, 483 F.2d at 1251 n.39. This variant of the traditional adversary process permits other experts, and the public, to bring to bear the purifying effect of their comments.

At least where the existing record is inadequate to sustain a rule, an agency cannot buttress its case with additional data not subject to public comment. "If a particular rule rests on an extensive analysis of data or a complex prediction . . . the agency should not rely on any research methods or data which were not presented to the interested parties for comment or criticism." Wright, *supra* note 23, 59 CORNELL L.REV. at 383, n.34 (1974).

It has become a commonplace among proponents of nuclear power to lament public ignorance.[63] The public—the "guinea pigs" who will bear the consequences of either resolution of the nuclear controversy—is apprehensive. But public concern will not be quieted by proceedings like the present.

> I know no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion.[64]

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[63] *See, e.g.*, Remarks by USNRC Commissioner Edward A. Mason at MIT (March 4, 1976) *quoted* SCIENCE & GOV. RPT., 4 (April 1, 1976):

> So the biggest problem impeding the contribution of nuclear power in meeting the nation's energy needs seems to me to be the lack of informed public understanding. . . .
>
> * * * *

Edward Teller, "Nuclear Salvation," NEWSWEEK (May 17, 1976) at 15:

> Indeed, there is no better subject with which to scare people than nuclear energy. What is new, what is not completely understood, is always frightening. But nuclear energy is a special case. It comes from a remote part of research that, in the minds of many people, borders on science fiction. It was developed in wartime and shrouded in secrecy. It came to the attention of mankind when, in two strokes, more than 100,000 people were killed in the final days of a terrible war. . . . Can we, in our democratic society, overcome unreasonable fears?

[64] Thomas Jefferson, Letter to William Charles Jarvis (Sept. 28, 1820).

The Commission's action in cutting off consideration of waste disposal and reprocessing issues in licensing proceedings based on the cursory development of the facts which occurred in this proceeding was capricious and arbitrary. The portions of the rule pertaining to these matters are set aside and remanded.[65]

[65] We are aware of suggestions that where agency action is based on an inadequate record, the appropriate remedy may be to remand for supplementation rather than a declaration that the rule or order is invalid. *See* Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U.PA.L.REV. 509, 539 (1974). *But cf.* Camp v. Pitts, 411 U.S. 138, 143 (1973): If the decision of the agency "is not sustainable on the administrative record made, then the . . . decision *must be vacated* and the matter remanded . . . for further consideration." *quoted* F.P.C. v. Transcontinental Gas Pipe Line Corp., *supra* note 26, 96 S.Ct. at 582 [emphasis added].

Separate Statement of Chief Judge BAZELON:

I add a word of my own on some of the broader implications of Judge Tamm's concurrence.

I agree that courts should be reluctant to impose particular procedures on an agency. For example, requiring cross-examination in a rulemaking proceeding is radical therapy, which may cause the patient to suffer a slow, painful death. "There is a not insignificant potential for havoc . . . [which is] likely to be disproportionate to the values achieved. . . ." *International Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 631 (D.C.Cir. 1973). But I reject the implication that any techniques beyond rudimentary notice and comment are needless "over-formalization" of informal rulemaking. Concur at 5. Unhappily, no such bright line can be drawn between rulemaking and adjudicatory proceedings.[1]

[1] The concurrence relies on Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L.REV. 375 (1974), which explicitly assumes an idealized model differentiating sharply between "policy-type rules or standards, on the one hand, and proceedings designed to adjudicate particular cases on the other." *Id.*, 386. This model posits that accurately determining facts is relatively unimportant in rulemaking because the "ultimate shape of the rule seldom 'follows from the facts.'" *Id.*, 379 n.15. Based on this conceptual distinction, drawn from Bi-Metallic Investment Co. v. State Bd. of Equalization, 239 U.S. 441 (1915), it is argued "An adjudication is fair to the individual only if the facts are accurately found. . . . [I]n the rulemaking context, fairness is not identified with accuracy, and procedures designed to maximize accuracy at the cost of all other values are simply inappropriate." *Id.*, 379.

With all due respect, this assumes away the hybrid rulemaking problem which arises primarily when rulemaking procedures are used in contexts where accurate fact-finding *is* of high relative importance. *See infra* p.2 and n.3.

The purpose of rulemaking was to allow public input on policy, whereas adjudication was designed to resolve disputed facts. *See supra* note 1. However, in response to the "paralysis" of the administrative process in the last decade, rulemaking has been expanded into fact-intensive areas previously thought to require adjudicatory procedures.[2] Administrative proceedings are now common which do not fit neatly into either the rulemaking or adjudicatory category. These new proceedings are "hybrids" in the sense that they involve issues of general applicability which can be treated efficiently only in generic proceedings, but nonetheless involve factual components of such relative importance that a greater assurance of accuracy is required than that which accompanies notice and comment procedures.[3]

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[2] *See, e.g.*, United States v. Allegheny-Ludlum Steel Corp., 406 U.S. 742 (1972); United States v. Florida East Coast Ry., 410 U.S. 224 (1973) (ratemaking).

[3] The development of scientific or technical standards is a prime example. These decisions may involve both assessing scientific evidence, and also a "legislative" or policy component as to what level of risk is "safe," and how uncertainties are to be valued. *See* Handler, *A Rebuttal: The Need for a Sufficient Scientific Base for Governmental Regulation*, 43 GEO.WASH.L.REV. 808, 809 (1975).

The relative centrality of the fact-finding and policy-making components may vary depending on the precise regulatory scheme and the state of knowledge. *Compare* Ethyl Corp. v. EPA, No. 73-2205 (D.C.Cir., March 19, 1976) (en banc) (legislative policy decision) *with* Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 390-402 (D.C.Cir. 1973), *cert. denied*, 417 U.S. 921 (1974).

The present proceeding was devoted almost entirely to technical fact-finding. The Commission characterized its purpose as data-gathering, rather than an analysis of alternatives or costs and benefits, 39 Fed.Reg. 14188, and specifically disclaimed that the values arrived at represented "safe" operating limits. *Id.*, 14190. This was simply not, as Judge Tamm states, a proceeding to arrive at an "administrative

The need for reliable fact-finding does not necessarily imply transplanting trial-type procedures. Factual issues in hybrid proceedings tend to be complex scientific or technical ones involving mathematical or experimental data, or other "legislative facts" [4] peculiarly inappropriate for trial-type procedures. Agencies should innovate procedural formats responsive to the new problems created by hybrid rulemaking. Some agencies (such as FDA and EPA) have already begun to do so.[5]

Decisions in areas touching the environment or medicine affect the lives and health of all. These interests, like the First Amendment, have "always had a special claim

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weighing of risks and benefits of additional reactors," Concur at 7, or to decide "whether licensing an additional reactor is worth the additional environmental risk . . . ." Concur at 5.

[4] *See* 2 Davis, Administrative Law Treatise § 15.03 (1958):

> When a court or an agency finds facts concerning the immediate parties—who did what, where, when, how, and with what motive or intent—the court or agency is performing an adjudicative function, and the facts are conveniently called adjudicative facts. . . .
>
> Stated in other terms, the adjudicative facts are those to which the law is applied in the process of adjudication. They are the facts that normally go to the jury in a jury case. They relate to the parties, their activities, their properties, their businesses. Legislative facts are the facts which help the tribunal determine the content of law and of policy and help the tribunal to exercise its judgment or discretion in determining what course of action to take. Legislative facts are ordinarily general and do not concern the immediate parties.

[5] Judge Tamm raises the specter that the "entirely predictable" response by administrators to "procedural refinements" will be so many adjudicatory procedures that "the advantages of informal rulemaking as an administrative tool. are lost in a heap of judicially imposed procedure." Concur

to judicial protection." [6] Consequently, more precision may be required than the less rigorous development of scientific facts which may attend notice and comment procedures.

Despite the controversy surrounding the proper standard of review in informal rulemaking cases, *see* Concur at n.2, there is less disagreement on this essential point than meets the eye. With customary perspicacity, Judge Friendly has observed that often it does not really matter much whether a court says the record is remanded because the procedures used did not develop sufficient evidence, or because the procedures were inadequate.[7] *From*

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at 6. Adjudicatory forms are no talisman which would guarantee an agency an adequate record.

Moreover, Williams, *"Hybrid Rulemaking" Under the Administrative Procedure Act: A Legal and Empirical Analysis*, 42 U.CHI.L.REV. 401 (1975), points out that the hybrid rulemaking cases have not in fact had that kind of impact on agency behavior. *Id.*, 425, 428, 448. Contrary to Judge Tamm's statement that cross-examination afforded only delay and something to be traded off for "substantative concessions," Concur at n.6, Williams actually discovered that the parties were able to agree on *procedural* innovations which better met their needs and were less time-consuming than cross-examination. *See* Majority Op., *supra* note 28.

[6] Environmental Defense Fund, Inc. v. Ruckelshaus, 439 F.2d 584, 598 (D.C.Cir. 1971) (Bazelon, C.J.). *See also* Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U.PA.L.REV. 509, 512-13 (1974).

[7] In discussing the article by Judge Wright, *supra* note 2, on which the concurrence relies, Judge Friendly writes:

> A judge not in the arena must wonder whether the war Judge Wright is waging with his colleagues is not in some degree semantic. . . . One can hardly quarrel with the conclusion that if a reviewing court finds that the procedures followed by the agency in adopting a rule have not produced a body of evidence enabling it to pronounce the required benediction, the court must remand. . . . It is thus not too consequential whether a court invalidates a rule on the ground that the procedures have

the standpoint of the administrator, the point is the same: the procedures prescribed by § 553 will not automatically produce an adequate record. Thus, although Judge Tamm vehemently opposes the concept of procedural review of informal rulemaking, he agrees to send this case back for a fuller development of the facts *even though the dictates of § 553 were followed.*[8]

Of course, important differences remain *from the standpoint of a reviewing court.* I am convinced that in highly technical areas, where judges are institutionally incompetent to weigh evidence for themselves, a focus on agency procedures will prove less intrusive, and more likely to improve the quality of decisionmaking, than judges "steeping" themselves "in technical matters to determine whether the agency has exercised a reasoned discretion." *See Ethyl Corp.* v. *EPA*, No. 73-2205 (D.C.Cir., March 19, 1976)

> not developed substantial evidence to support it or even evidence adequate to rebut a claim that it is arbitrary and capricious, or, instead, takes the route of prescribing ad hoc procedural requirements in addition to those of section 553. . . . Both roads lead to the conclusion that an administrator engaged in rulemaking governed by the APA cannot always be sure that rudimentary notice and comment procedures, even if they measure up to Judge Wright's salutary specifications, will always suffice.

Friendly, *Some Kind of Hearing*, 123 U.PA.L.REV. 1267, 1313-14 (1975) [footnotes omitted].

[8] The logic of Judge Tamm's position that the "deficiency" here is not with the procedures used to make a record, just with the "record generated," Concur at 2, totally escapes me.

Judge Tamm also criticizes the court for failing to tell the Commission "in precise terms" how to achieve a "thorough ventilation" of the factual issues. Concur at 3. He apparently finds greater specificity in an instruction to the Commission to provide "an explanation of the basis" of its conclusions. Concur at 7.

(en banc) (Bazelon, C.J., concurring), *cert. denied*, 44 U.S.L.W. 3719 (June 10, 1976).[9]

[9] *Cf.* Lathan v. Brinegar, 506 F.2d 677, 693 (9th Cir. 1974) (en banc):

> We think that the courts will better perform their necessarily limited role in enforcing NEPA if they apply [the "without observance of procedure required by law" standard of 5 U.S.C.] § 706(2)(D) in reviewing environmental impact statements for compliance with NEPA than if thy [sic] confine themselves within the straight jacket of [the "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law" standard of 5 U.S.C.] § 706(2)(A).

See also Ohio v. Wyandotte Chem. Corp., 401 U.S. 493, 504 (1971) (original jurisdiction declined in pollution case involving complex, novel and technical factual questions):

> . . . Ohio is raising factual questions that are essentially ones of first impression to the scientists. The notion that appellate judges, even with the assistance of a most competent Special Master, might appropriately undertake at this time to unravel these complexities is, to say the least, unrealistic. Nor would it suffice to impose on Ohio an unusually high standard of proof. That . . . would not lessen the complexity of the task of preparing responsibly to exercise our judgment, or the serious drain on the resources of this Court it would entail.

TAMM, *Circuit Judge, separate statement concurring in result*:

Licensing a nuclear reactor unquestionably constitutes a "major Federal action[] significantly affecting the quality of the human environment" requiring a "detailed" environmental impact statement under section 102 (2)(C) of NEPA, 42 U.S.C. § 4332(2)(C)(1970). Approval of such a facility, which inevitably will produce high level radioactive wastes, some of which must be isolated from the "biosphere" for a quarter of a million years, undeniably necessitates an "irreversible and irretrievable commitment[] of resources" within the meaning of the Act. 42 U.S.C. § 4332(2)(C)(v). A panel of this court has previously indicated that NEPA requires potential environmental problems of this magnitude to be dealt with in advance of such a substantial commitment, not ignored until new commitments inevitably follow from the old. *See, e.g., Calvert Cliffs' Coordinating Comm. v. AEC*, 449 F.2d 1109, 1128 (D.C. Cir. 1971).[1] I agree with the majority that NEPA requires the Commission fully to assure itself that safe and adequate storage methods are technologically and economically feasible. It forbids reckless decisions to mortgage the future for the present, glibly assuring critics that technological advancement can be counted upon to save us from the consequences of our decisions. I further agree with the conclusion of the majority that it is impossible to determine from the record before us whether the Commission has fulfilled its statutory obli-

[1] A major purpose of NEPA was to avoid the limiting effect of incremental decisionmaking by confronting environmental problems before foreclosing alternative methods of dealing with them. *See* S. Rep. No. 296, 91st Cong., 1st Sess. 5 (1969), *quoted in* Majority 9. To this end, NEPA requires a thorough cost-benefit study in each case before undertaking major federal action affecting the quality of the human environment. Calvert Cliffs' Coordinating Comm. v. AEC, *supra* at 1128.

gation under NEPA in adopting the S-3 table, in effect deciding that the incremental environmental effect of storing the waste of an additional nuclear reactor is negligible, or whether it has uncritically adopted as its own the undocumented conclusions of a single witness that the waste storage issue is a "non-problem" with which the Commission need hardly concern itself at this time. Accordingly, the inadequacy of the record demands that we remand this case to the Commission in order to ensure that it has taken a hard look at the waste storage issue. I cannot, however, without qualification, endorse the approach the majority has taken to reach this result or its suggested disposition on remand.

The majority appears to require the Commission to institute further procedures of a more adversarial nature than those customarily required for informal rulemaking by the Administrative Procedure Act, 5 U.S.C. § 553 (1970).[2] The Commission chose to proceed by "hybrid" rulemaking below, allowing petitioners to present oral arguments before the Commission and subjecting participants to questions, but not permitting participants to cross-examine. Majority note 59. By so proceeding the Commission exceeded the minimum procedural requirements of section 553.[3] In my view, the deficiency

[2] The standard of review under section 553 has been the subject of considerable discussion in recent years, especially within this judicial circuit. *See, e.g.*, the cases and articles cited in Majority note 23.

[3] Section 553 imposes only three obligations on the rulemaker. First the rulemaker must give adequate and effective notice of "either the terms or substance of the proposed rule or a description of the subjects and issues involved." Secondly, he must "give interested persons an opportunity to participate . . . through submission of written data, views, or arguments with or without opportunity for oral presentation." Finally, the rulemaker must "incorporate in the rules adopted a concise and general statement of their basis and purpose." 5 U.S.C. § 553 (1970). *See generally* Verkuil, *Judicial Review of Informal Rulemaking*, 60 VA. L. REV. 185 (1974).

The "concise and general statement" required by section 553 must be sufficiently complete and detailed to enable the court to accomplish its reviewing function, assuring itself that the agency has engaged in reasoned decisionmaking, has given serious thought to alternative rulings, and has provided reasoned explanations for controversial normative and empirical determinations. In short, "the reviewing court must satisfy itself that the requisite dialogue occurred and that it was not a sham." Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L. REV. 375, 381 (1974).

[4] The majority also recognizes that the procedures utilized by the Commission might suffice "if administered in a more sensitive, deliberate manner." Majority 40.

[5] *See* Environmental Defense Fund, Inc. v. Corps of Engineers, 470 F.2d 289 (8th Cir.), *cert. denied*, 412 U.S. 931 (1972), in which the Eighth Circuit Court of Appeals held that, although NEPA requires agencies to evaluate objectively

is not with the *type* of proceeding below, but with the completeness of the record generated.[4] More procedure will not, in this case, guarantee a better record, and a better record can be generated without reopening the oral proceeding at this time. We cannot conclude confidently from this record whether the Commission's staff considered all relevant factors, including the facts petitioners call to our attention, in reaching the figures embodied in Table S-3; nor can we conclude from Dr. Pittman's oral statements, substantially devoid of documentation, whether these figures represented conclusions drawn from more exhaustive research into the waste storage problem conducted by the head of the Commission division charged with this task. If Dr. Pittman's conclusions were so based, I believe the Commission is entitled to accept them, provided, of course, it is assured that they are reasonably objective.[5]

I am also troubled by two other aspects of the majority opinion. First, I am distressed because I believe the majority opinion fails to inform the Commission in precise terms what it must do in order to comply with the court's ad hoc standard of review.[6] The majority sends the waste storage issue back to the Commission for a "thorough ventilation." This language, of course, means very little in procedural terms. In order to aid the Commission in filling in the gaps in the record, the majority enumerates a number of procedural alternatives in varying degrees of formality, some less intrusive into agency prerogatives than others. Majority 39. Then, heeding the Supreme Court's admonition in *FPC v. Transcontinental Gas Pipe Line Corp.*, 96 S.Ct. 579 (1976) (per curiam), that we may not, except in extraordinary circumstances, specify agency procedures on remand, the majority declines to give the Commission any direction as to which procedure or combination of them, will suffice. The Commission is thus left to decide which to adopt, further confused by the majority's statement that, "It may be that no combination of the procedures mentioned above will prove adequate, and the agency will be required to develop new procedures to accomplish the innovative task of implementing NEPA through rulemaking." Majority 39. Such specificity resembles a

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their projects, it does not require agency officials to be subjectively impartial. In other words,

> NEPA assumes as inevitable an institutional bias within an agency . . . and erects the procedural requirements of § 102 to insure that there is no way the decision-maker can fail to note the facts and understand the various arguments advanced by the plaintiffs if he carefully reviews the entire environmental impact statement.

Id. at 295 (quotation marks and citation omitted).

[6] Judicial imposition of procedural requirements on an ad hoc basis is criticized in Wright, *supra*.

standardized test in which there are numerous possible answers, including "all of the above," "none of the above," or "various combinations of the above." The result, I believe, is entirely predictable: the Commission may or may not adopt one of the majority's suggestions, but will in any case seek to comply by mechanically generating more "negative" information respecting current problems with disposal of high level radioactive wastes and then will "overcome" this information with citations to favorable studies and articles. Ultimately, of course, the Commission must decide which information to accept and which to reject, regardless of the type of procedure used. The majority opinion appears to recognize as much when it volunteers that, "On the other hand, the procedures the agency adopted in this case, if adminstered in a more sensitive, deliberate manner, might suffice." Majority 40 (citation omitted). This time, however, the decision whether licensing an additional reactor is worth the additional environmental risk would be one of policy or risk assessment and, consequently, would be reviewable only according to the customary "arbitrary, capricious" standard. *Amoco Oil Co. v. Environmental Protection Agency*, 501 F.2d 722, 741 (1974). I believe it almost inevitable that, after fully considering the problems and alternative methods of waste disposal and storage, the Commission will reach the same conclusion and therefore see little to be gained other than delay from imposing increased adversarial procedures in excess of those customarily required.[7]

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[7] It has been argued that those cases in which we have granted a limited right of cross-examination on remand have afforded little relief other than delay and a tool with which to bargain for substantive concessions. Williams, *"Hybrid Rulemaking" Under the Administrative Procedure Act: A Legal and Empirical Analysis*, 42 U. CHI. L. REV. 401, 436-48. It would seem, therefore, that the right of cross-examination at a rulemaking proceeding frequently is better to have and be denied than to utilize.

This brings me to my second, related concern with the majority's approach. I believe the majority's insistence upon increased adversariness and procedural rigidity, uneasily combined with its non-direction toward any specific procedures, continues a distressing trend toward over-formalization of the administrative decision-making process which ultimately will impair its utility. As Judge Wright has recently noted, the administrative response to overuse of judicial imposition of such ad hoc procedural refinements is easily foreseeable. Fearing reversal, administrators will tend to over-formalize, clothing their actions "in the full wardrobe of adjudicatory procedures," until the advantages of informal rulemaking as an administrative tool are lost in a heap of judicially imposed procedure. Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L. REV. 375, 387-88 (1974).[8] The majority's

[8] A further problem with over-reliance on the hybrid rulemaking approach has its roots in the hostility of some judges to all forms of substantive review of agency decisions. The line between substantive and procedural review is, of course, a hazy one. The same judges who most vehemently protest against judicial intrusions into the substance of administrative action, especially in highly technical areas, may not hesitate to require relatively more procedure of an agency when they dislike its substantive result. There is, I believe, a danger that judges will feel less restrained in requiring agencies to adopt procedures in excess of those required by the APA when review is couched in procedural, rather than substantive, terms. The preoccupation of the majority opinion in this case with the half-life of the plutonium atom and the myriad of geological and other technical difficulties one faces in attempting to safely store a highly toxic substance for a quarter of a million years demonstrates that judges cannot avoid the task of immersing themselves in difficult and often technical matters in order to evaluate administrative action and assure themselves that the agency has in fact dealt with all major issues. Because the relative environmental importance of the waste disposal issue before us is the subject of some

reliance upon the so-called "hybrid rulemaking" cases[9] for its conclusion that the procedures prescribed by section 553 are inadequate for resolution of the complex issues involved in this case and its insistence that the Commission adopt more formal adversary procedures are, I believe, misplaced. Admittedly, there are rare cases in which "basic considerations of fairness" require procedures more adversarial than those prescribed by section 553. *See* Majority 14-15, *quoting from* Respondent's Brief at 13-14. I cannot agree, however, that this case requires us to reach this issue. Remanding an agency decision with instructions to initiate such procedures is an extraordinary judicial remedy which, I believe, should be reserved for extraordinary cases.

The appropriate remedy at this point is not to impose ad hoc procedural requirements in an attempt to raise the level of petitioners' participation, already adequate under section 553, but to remand for an explanation of the basis of Dr. Pittman's statements and of the staff's numerical conclusions,[10] *i.e.* for the documentation which the majority finds so conspicuously lacking.[11] The

controversy, arguments about whether our focus here is "procedural" or "substantive" may be more semantic than determinative.

[9] *See* the cases cited at note 23 of the majority opinion.

[10] As the majority states, due process considerations probably mandate that petitioners be allowed to comment upon any additional information assembled by the Commission. Neither the Constitution nor the Administrative Procedure Act, however, directs the Commission to allow additional oral presentation, cross-examination, or any other procedures in addition to those required by section 553.

[11] The extent of the required statement of basis may vary, of course, according to the precise demands and issues of each particular case, but, "[a]t a minimum, the statement should refer to relevant submissions by interested parties and should

Commission should be able to supply the court with a statement of the methods by which its staff arrived at the figures embodied in Table S-3 and by which Dr. Pitt-

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rebut or accept these submissions in an orderly fashion." Wright, *supra* at 381. This court has also distinguished between factual determinations and policy choices more peculiarly within the expertise of the administrative agency. In the former case, we commonly have insisted upon sufficient attention to the facts to enable the reviewing court to ascertain the underlying rationality of the resultant regulations. Amoco Oil Co. v. Environmental Protection Agency, 501 F.2d 722 (D.C. Cir.), *cert. denied*, 417 U.S. 921 (1974). In contrast,

> [w]here . . . the regulations turn on choices of policy, on an assessment of risks, or on predictions dealing with matters on the frontiers of scientific knowledge, we will demand adequate reasons and explanations, but not "findings" of the sort familiar from the world of adjudication.

Id. at 741.

Often, of course, an agency ruling will encompass both factual determinations and policy choices. This is such a case. For example, the decision to treat the waste storage issue through generic rulemaking because it is common to all licensing decisions is clearly a policy determination within the agency's special expertise which we should review only for clear abuse of discretion. *See* NLRB v. Bell Aerospace Co., 416 U.S. 267 (1974). The decision to license a particular reactor is also a policy or "assessment of risks" decision within the agency's discretion, provided it has adequately considered all underlying factual issues, including the waste storage issue, and has determined to its own satisfaction that safe methods of production and waste storage are already technologically and economically feasible. Finally, once so assured, the decision to postpone until later the question as to which of several feasible methods should be utilized is also, I believe, a policy, or risk assessment, decision.

This case, however, involves related factual determinations for which we must find support in the statement of basis required by section 553. Of particular relevance here is Table S-3, which reduces the environmental effect of licensing an additional reactor to certain numerical values and, in ef-

man concluded that the waste storage problem is already technologically and economically soluable. If it cannot, then we will have no choice but to invalidate the Commission's rule under the "arbitrary, capricious" standard; if it can, we should defer to the administrative weighing of risks and benefits of additional reactors.

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fect, concludes that it is negligible. The claimed bases for the judgments expressed in numerical terms in Table S-3 are the data assembled by the staff in the draft Environmental Survey, adopted without substantial modification as Table S-3 and thus embodied in the final rule. As the majority indicates, neither the Survey itself, the back-up documentation to which it refers, nor the oral and written testimony offered at the hearing adequately supports these factual conclusions with respect to the waste disposal issue. Majority 21-22. The detailed explanation which characterizes other portions of the Environmental Survey is notably absent from this portion.

DOCKET No. 50-271

ALAB-56

IN THE MATTER OF VERMONT YANKEE NUCLEAR POWER CORPORATION (VERMONT YANKEE NUCLEAR POWER STATION)

Issued June 6, 1972

ATOMIC SAFETY AND LICENSING APPEAL BOARD:
SIDNEY G. KINGSLEY, *Chairman.*
DR. JOHN H. BUCK.
DR. LAWRENCE R. QUARLES.

MEMORANDUM AND ORDER

During the course of extended hearings for the issuance of an operating license for this nuclear power station,[1] the Atomic Safety and Licensing Board has referred to us on December 29, 1971, under Subsection 2.730(f) of the Rules of Practice, 10 CFR Part 2, certain rulings concerning the scope of environmental review under 10 CFR Part 50, Appendix D, as revised September 9, 1971.[2]

The referral by the Licensing Board does not explicitly identify the questions to which it seeks answers. It cites the Board's rulings at certain pages of the transcript. Those rulings refer in general terms to proceedings which we have sought out in the record.

[1] The provisional construction permit was issued on December 11, 1967.

[2] 36 Fed. Reg. 18071. See also 36 Fed. Reg. 18716, September 21, 1971; 36 Fed. Reg. 19153, September 30, 1971; 36 Fed. Reg. 21579, November 11, 1971; 36 Fed. Reg. 23900, December 16, 1971; 37 Fed. Reg. S64, January 20, 1972; 37 Fed. Reg. 9619, May 13, 1972; 37 Fed. Reg. 9779, May 17, 1972.

The referral originated in a motion of the intervenors Natural Resources Defense Council, Inc. (NRDC). It has two principal aspects:

a. The Board has referred to us oral rulings in which it sustained objections to questions and to interrogatories concerning the levels of radioactivity and the associated hazards which might be included in the operations of a reprocessing plant to which irradiated fuel from the Vermont Yankee plant might ultimately be sent for reprocessing, and the transportation of high level radioactive wastes from such a reprocessing plant to an ultimate storage area.

b. The Board has also referred a motion of NRDC which requested that, under Subsection 2.785(d) of the Rules of Practice, the substantive questions be certified to the Atomic Energy Commission on the asserted ground that a broad policy question is involved which should be determined by the Commission.

The original motion of NRDC sought orders of the Licensing Board which would open for consideration in the proceeding the environmental impact of spent fuel transportation and reprocessing, the disposition and ultimate storage of high level wastes, and the disposal of the contaminated structures of the nuclear generating station at the end of its useful life when it is decommissioned.

The Licensing Board denied the motion of NRDC, which, after the decision in *Calvert Cliff's Coordinating Committee, Inc.* v. *Atomic Energy Commission,* 449 F.2d 1109 (D.C. Cir. 1971), presented its "Renewed Motion . . . for Full Consideration of Waste Handling Issues", for orders directing the staff to prepare a new detailed statement on environmental considerations, directing the applicant to respond to certain related specific interrogatories, and permitting NRDC to introduce evidence by direct testimony and cross-examination of witnesses. The motion was supported by the intervenor New England Coalition on Nuclear Pollution.

We consider at the outset the request that the Appeal Board certify to the Commission the substantive questions which are now in issue.

Under paragraph 2.785(a)(1) of its Rules of Practice, 10 CFR Part 2, the Commission has delegated to the Appeal Board the authority and the review function which would otherwise be exercised and performed by the Commission itself. See 36 Fed. Reg. 3837, 3838, February 27, 1971. Having been given the responsibility of relieving the Commission of this burden, it is our obligation to carry it out, subject to the Commission's review, unless we conclude that we are incapable of doing so without prejudice to the Commission's performance of its duties. See *1969 Annual Report, Administrative Conference of the United States,* pp. 17, 38-39. If the Commission in its wisdom should conclude that it should review on its own motion a decision or action of this Appeal Board, it will doubtless exercise its reserved power to do so. 10 CFR Section 2.786.

The motion of NRDC and the related rulings of the Licensing Board raise the question of the scope of Appendix D of Part 50 of the Commission's regulations. Appendix D is patterned upon the language of Section 102 of the National Environmental Policy Act of 1969, P.L. 91-190, 43 U.S.C. 4321 *et seq.* The Commission initially published Appendix D as an interim statement of general principles and procedures under that Act (35 Fed. Reg. 18469, December 4, 1970; see also 35 Fed. Reg. 5463, April 2, 1970). After the decision of the United States Court of Appeals for the District of Columbia Circuit in *Calvert Cliffs' Coordinating Committee* v. *Atomic Energy Commission,* 449 F.2d 1109 (July 23, 1971), it published a revised Appendix D (36 Fed. Reg. 18071, September 9, 1971).

The issues presented by the NRDC motion and the referred rulings, as they now lie before this Appeal Board,

appear to be whether the Licensing Board is to consider the environmental hazards of transporting and reprocessing spent fuel from the facility, transporting and disposing of the high level wastes issuing from reprocessing, transportation and storage of low level wastes, and ultimate disposal of the contaminated structures of the facility itself at the end of its useful life; and whether the detailed environmental impact statement prepared by the staff must address each of these issues.

We have concluded that the Licensing Board should consider the transportation of spent fuel to a reprocessing plant, and the transportation from the nuclear power plant of high level wastes as well as of low level wastes, but should not consider in this proceeding operations of a reprocessing plant or the disposal of wastes resulting from reprocessing. We have also concluded that the environmental effects to be addressed by the staff should extend to and be limited to the same scope.

During the course of the proceeding NRDC has served voluminous interrogatories on various subjects, including radioactive wastes and their disposal. The applicant has answered almost all of them, but has declined to answer two concerning reprocessing and the disposal of wastes from a reprocessing plant. The staff's draft detailed statement on environmental considerations, which has been filed since the Licensing Board's referral to us, has taken into account the handling of radioactive wastes at the plant and the transportation of irradiated nuclear material and solid radioactive waste from the plant.

Section A of Appendix D, 10 CFR Part 50, which prescribes the scope of the subject matter of the environmental study to be conducted in implementation of paragraph 102(2)(C) of the National Environmental Policy Act, de-

fines that subject matter in the same language as paragraph 102(2)(C), 42 U.S.C. 4332(2)(C):

> "(i) the environmental impact of the proposed action,
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
> (iii) alternatives to the proposed action,
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

The applicant has included in its environmental study the transportation of irradiated fuel from the reactor to a fuel reprocessing plant, as well as the transportation of packaged radioactive material from the reactor to burial grounds for low level wastes. It has done so pursuant to a memorandum of September 1, 1971, distributed by the Director of Regulation by means of a circular letter of September 3, 1971. The memorandum of September 1 was not a regulation adopted and published in accordance with Section 4 of the Administrative Procedure Act, 5 U.S.C. 553. It was a guide (see 36 Fed. Reg. 22851, n. 1, (1971) which did not establish a definitive regulatory requirement, but merely represented a solution considered acceptable as complying with requirements otherwise imposed.[3]

We conclude that the exclusion of the reprocessing function and its resulting wastes from the environmental study

[3] If a statement of policy is intended to have binding effect, it is a "rule" (Sec. 2(c). Administrative Procedure Act, 5 U.S.C. 551(4)) which becomes effective when adopted pursuant to the procedures of Section 4, *National Labor Relations Board* v. *Wyman-Gordon Co.*, 394 U.S. 759, 763–765 (1969); *Texaco, Inc.* v. *Federal Power Commission*, 412 F.2d 740 (3d Cir. 1969); *National Motor Freight Traffic Association* v. *United States*, 268 F. Supp. 90 (D.C. 1967), aff'd 393 U.S. 18 (1968); *Seaboard World Airlines, Inc.* v. *Gronouski*, 230 F. Supp. 44 (D.C. 1944); *Devcon Corp.*, 70 F.T.C. 1780, 20 Ad. L. 2d 292 (1966).

required by paragraph 102(2)(C) and by Appendix D of Part 50 is consistent with the purposes of the Environmental Policy Act and Appendix D and is proper.

Congress has directed in the Environmental Policy Act that an agency follow certain procedures in its decision making, and take into account the specified environmental factors; but it has not prescribed that any particular result shall follow when those factors have been taken into account.[4]

Whether the Environmental Policy Act and Appendix D of Part 50 should be so construed that the environmental study to be accomplished in this individual reactor licensing proceeding is to be extended to the reprocessing of fuel elements in a reprocessing plant and the disposition of waste resulting from that process requires examination of the relation of this reactor to the reprocessing function against the background of the nature, size and structure of the nuclear industry. We may take official notice of these general circumstances as descriptive of the nuclear industry at large.[5]

There are well over 100 commercial central station nuclear plants which are operable, under construction, or on order; more than 20 of these are already operating under license, about 40 have been granted construction permits and are in the course of operating license proceedings, about 15 more have been granted construction permits, and ap-

[4] *Calvert Cliffs' Coordinating Committee* v. *Atomic Energy Commission*, 449 F.2d 1109, 1112, 1115 (D.C. Cir. 1971); *Committee for Nuclear Responsibility* v. *Seaborg*, 463 F.2d 783 (1971), 3 E.R.C. 1126 (D.C. Cir. Oct. 5, 1971); *Upper Pecos Association* v. *Stans*, 452 F.2d 1233 (10th Cir. 1971).

[5] 10 C.F.R. Sec. 2.743(i); *Attorney General's Manual on the Administrative Procedure Act*, 79–80; *Davis, Administrative Law Treatise*, Vol. 2 and 1970 Supp., Secs. 15.03–15.06.

proximately another 40 are in construction permit proceedings. *Nuclear Industry 1971,* U.S. Atomic Energy Commission, 81. In addition to chemical reprocessing facilities operated by the Commission, three commercial reprocessing plants are in operation or under construction, and at least one other may be built in the near future. *Id.*, 133-136.

The record indicates that none of the nuclear fuel in the Vermont Yankee reactor will be replaced or reprocessed until 18 months after the commencement of operation, when about 4 percent of the fuel assemblies will be replaced. It is expected that about 40 percent of the fuel assemblies will be replaced 12 months later, and that 25 to 30 percent will be replaced each 12 months thereafter. As assemblies are removed from the reactor they will be stored in a storage pool at the site for 3 or 4 months at least, until they are shipped to a reprocessing plant. The spent fuel will be transported, under contracts to be let by Vermont Yankee, in heavily shielded casks by truck or rail, under applicable regulations of the Atomic Energy Commission (see e.g., 10 CFR Parts 70, 71, 73) and of the Department of Transportation (49 CFR Parts 172, 173).

Aside from the spent fuel, the wastes which will be generated at the plant will consist largely of slightly contaminated water treatment resins and such miscellaneous slightly contaminated items as rags, floor sweepings, worn-out equipment and paper. A small portion of the resins, amounting to about 65 cubic feet per year, will be slightly higher in activity and will be transported in appropriately designed and shielded casks, probably by tractor-trailer.

We recognize that there will be an incremental environmental effect ultimately resulting from the operation of this reactor as the result of the operation of whatever reprocessing plants and disposal grounds may from time to time be used during the life of the plant. There is no way

of ascertaining now which of the various reprocessing plants now in existence or to be constructed will from time to time receive some irradiated fuel elements from this plant for reprocessing during its estimated 40-year life. Reprocessing plants do not all use the same method of chemical separation of fissionable materials from the wastes, and there is no reason to believe that during the useful life of the Vermont Yankee plant other methods will not be developed for that purpose.

Each reprocessing plant which has been and will be constructed is a "production facility" within the meaning of Paragraph 50.2(a)(3) of the Commission's regulations (10 CFR Part 50). In the interest of the protection of the public health and safety and the national security, each has been or will be subjected to full review under 10 CFR Part 50 and other pertinent regulations through the procedures established in 10 CFR Part 2 for such a facility. Each plant not yet licensed will be subjected to full environmental review as a part of the Commission's licensing action under Paragraph 102(2)(C) of the Environmental Policy Act (10 CFR Part 50, App. D, par. A.1) — the procedure which NRDC now seeks, in effect, to invoke in this licensing proceeding for those same facilities *en masse*. The procedures are already in course for two reprocessing plants which are under construction or awaiting operation.[8]

The scope of the inquiry required by Paragraph 102(2)(C) is repeatedly defined, by the language of that section and as reflected in the language of Appendix D, as the impact, the consequences and the alternatives of "the proposed action", which in the present case is the licensing of a specific nuclear power reactor. The language of Section 102 directs that the environmental statement shall be

[8] *Matter of General Electric Company* (Docket No. 50-268); *Matter of Allied Gulf Nuclear Systems, Inc.* (Docket No. 50-332).

accomplished "to the fullest extent possible". But "the proposed action" is the licensing of the Vermont Yankee reactor and not of other present and future facilities at other places, to be operated by other firms, and having at best a contingent and presently indefinable relation to this facility. Paragraphs A.3, A.4, and A.8 of Appendix D repeatedly refer to the environmental impact of "the facility" as defining the scope of the analysis. Paragraph A.10 refers to "the proposed licensing action", meaning the licensing of the particular facility which is before the Licensing Board and before us in a specific proceeding.

It is evident to us that evaluation of the environmental effects of the operation of one or more unidentifiable reprocessing plants, employing separation processes which are unidentified and which may or may not now be known or used, during the course of the forty-year life of the plant, is not possible at this time and in this proceeding. If the fuel elements of the Vermont Yankee plant pass through the process stream of one reprocessing plant or another now operating or to operate in the future, preceded and followed by the fuel elements and their constituents from other plants, we cannot see how any effect of that process on the environment, taking into account the factors enumerated in Subsection 101(b) and Section 102 of the Environmental Policy Act, 42 U.S.C. Subsection 4331(b), 4332, can be analyzed except as a part of the integrated analysis of the total operation of that specific reprocessing plant. This analysis will be conducted for each reprocessing plant to be built in connection with the licensing of that plant as a "facility". Any reprocessing plant now in existence, if not already required to be subject to environmental review (see 10 CFR Part 50, App. D, Section B, Section C, and paragraphs A.1, A.8, and A.14) will be subject to review before any modification is permitted which, in the language

of Paragraph 102(2)(C), is one "significantly affecting the quality of the human environment."

No one has indicated, and we are unable to perceive, any significant respect in which the Vermont Yankee plant will have any different relation from any other nuclear power station to the reprocessing part of the fuel cycle. The logical consequence of the position of NRDC is that in every reactor licensing proceeding it would be required by Paragraph 102(2)(C) that there be an environmental analysis of the operation of every reprocessing plant, present and future, to which its nuclear fuel might be sent for reprocessing. We cannot believe that this was the intent of Congress in directing that there be an environmental analysis in each case of "the proposed action".

In specifying the scope of the environmental analysis prescribed by Paragraph 102(2)(C) as applicable to nuclear facilities, Appendix D has reflected the guidance of the Council on Environmental Quality,[7] which has been designated by Congress in Subsection 102(B) and Title II of the Environmental Policy Act, 42 U.S.C. 4342, as the consultant to insure appropriate consideration of environmental amenities and values.

The conclusion we reach is consistent with the "Guidelines of the Council on Environmental Quality for Statements on Proposed Federal Actions Affecting the Environment" (36 Fed. Reg. 7724, 1971). Although the "actions" subject to the Guidelines "are not limited to" those enumerated explicitly in Paragraph 5, it is evident on reading the Guidelines as a whole that each environmental impact statement should be about a specific "project . . . involving a Federal . . . license" (e.g. par. 5(a)(ii), 5(b)) or a specific

[7] See 35 Fed. Reg. 18469, December 4, 1970; 36 Fed. Reg. 18071, September 9, 1971.

"action" (par. 6(a)(i)(iii)(iv)). The Guidelines do not contemplate that the comprehensive environmental review of every "project" or "action" is required to include other "projects" or "actions". They thus speak of the effect of the proposed change upon "the area in question". (Par. 6(a)(ii); *cf.* pars. 9, 10). The "project . . . involving a Federal . . . license" (par. 5(a)(ii)) which we have before us is the operation of the Vermont Yankee reactor.

We are not concerned here with a situation in which a single "project" or "action" by the agency is being fragmented (*Named Individual Members of San Antonio Conservation Society* v. *Texas Highway Department*, 446 F.2d 1013 (5th Cir. 1971)), but one in which we are simply called upon to ascertain the scope of the environmental review to be conducted in this proceeding by defining the "action" in which the agency is engaged.

The staff's voluminous draft detailed impact statement on the environmental considerations relating to the proposed issuance of the Vermont Yankee operating license, which has been filed under the Guidelines of the Council on Environmental Quality and the Commission's Appendix D, will be referred for comment to other Federal agencies and State and local officials. The draft detailed statement includes, among other things, consideration of the radioactive wastes to be produced, the waste treatment and waste handling systems, and the transportation of and disposition of solid radioactive wastes. It also considers the ultimate decommissioning and decontamination of the plant. The inclusion of these subjects in the staff's draft statement, with such further evidence as may be admitted and the Licensing Board's findings and conclusions under Appendix D, will dispose of so much of the motion of NRDC as relates to them.

It should not be assumed that the environmental effects of the handling and disposition of wastes are being neglected. The Commission has issued a guide for the submission of information for the evaluation of the environmental effects of facilities (37 Fed. Reg. 10013, 1972), and the development of these detailed criteria is continuing. Under Section 202 of the Atomic Energy Act, 42 U.S.C. 2252, the Commission is required to keep the Joint Committee on Atomic Energy "fully and completely informed with respect to all of the Commission's activities", and the Joint Committee is required to conduct and has conducted continuing studies of the activities of the Commission. The transportation and disposition of high level wastes have repeatedly been the subject of testimony before the Joint Committee, and have at times been the subject of extended hearings.[8]

The adoption of NRDC's position could as a practical matter call a halt to the licensing of individual reactors. No power reactor could be licensed until every present and future reprocessing plant was studied in some depth — a process that would in turn, we presume, be asserted to involve every present and future power reactor in order to determine just what wastes would pass through each reprocessing plant. The operation of a reprocessing plant and the disposition of its wastes can and should be evaluated in the licensing proceeding for each reprocessing plant. "Each action" and "each project" and its environmental effects will thus be considered in depth in the appropriate proceeding which will best disclose the elements to be

[8] See *e.g.*, Hearings, Industrial Radioactive Waste Disposal, January 28–30, 1959, February 2–3, 1959, July 29, 1959; Hearings Environmental Effects of Producing Electric Power, October 28–31, 1969, November 4–7, 1969, January 27–30, 1970, February 24–26, 1970; see also Selected Materials on Environmental Effects of Producing Electric Power, Joint Committee on Atomic Energy, 91st Cong., 1st Sess., August 1969.

weighed. Each such proceeding will provide "a useful point at which public pressure can be placed". F. S. Cohen, *Field Theory and Judicial Logic,* 59 Yale L.J. 238, 251-2 (1959). For a particular nuclear reactor, analysis will thus be in its own individual proceeding, such as this one; for a particular reprocessing plant, analysis will be conducted in its own licensing proceeding with consideration of all the circumstances on the basis of which its particular environmental effects can be intelligently considered: its location, surroundings, design, processing method, capacity, and similar individual characteristics. Only in this way can the purposes of the Environmental Policy Act be sensibly and effectively served.[9]

Our careful study of the opinion of the Court of Appeals for the District of Columbia Circuit in *Calvert Cliffs' Coordinating Committee, Inc.* v. *Atomic Energy Commission,* 449 F.2d 1109 (1971), does not lead us to any different conclusion. Notwithstanding strong language in that case on

[9] The Administrative Conference of the United States has recommended reasonable limitation of alternatives to be considered in licensing procedures (Recommendation No. 15. Consideration of Alternatives in Licensing Procedures, 1969 Annual Report, Administrative Conference of the United States (1970), 45:

"Court decisions, notably *Scenic Hudson Preservation Conference* v. *FPC,* [354 F.2d 608 (2d Cir. 1965), *cert. denied,* 384 U.S. 941 (1966)] have emphasized that in licensing cases the Federal Power Commission must explore and give proper consideration to possible alternatives to the specific plan proposed by the applicant. This principle may in the future be applied to other licensing agencies. Since the range of possible alternatives in any case can be extensive and in some cases virtually unbounded, ways must be sought to control the scope and duration of licensing proceedings within manageable limits while meeting the requirements of the law.

"RECOMMENDATION

"Each agency which issues licenses . . . should seek to create procedures fitting its particular circumstances which will assure appropriate consideration of alternatives where necessary, and at the same time will permit effective administration of that agency's licensing functions."

the issues there presented, the Court's observations are addressed to the environmental study of "the proposal" or "the proposed action", in the language of the Environmental Policy Act, and to "a particular project" (449 F.2d at 1114, 1123).

In *Natural Resources Defense Council, Inc.* v. *Morton,* 458 F.2d 827, 3 E.R.C. 1558 at 1563, 1564 (January 13, 1972), the same Court has more recently pointed out that the required discussion of environmental effects need not be exhaustive, but is required only to extend to reasonable lengths:

"The statute must be construed in the light of reason if it is not to demand what is, fairly speaking, not meaningfully possible . . .".

* * *

"So long as the officials and agencies have taken the 'hard look' at environmental consequences mandated by Congress, the court does not seek to impose unreasonable extremes or to interject itself within the area of discretion of the executive as to the choice of the action to be taken."[10]

That the Court was unanimous in the views we have quoted is evidenced in the separate opinion of Judge MacKinnon (458 F.2d 827 at 839, 3 E.R.C. at 1565-1570).

Our conclusion is reinforced by *Scientists' Institute for Public Information, Inc.* v. *Atomic Energy Commission,* Order of Court (D.C. March 24, 1972), in which the Court rejected the claim that, in connection with the construction of a proposed experimental fast breeder reactor, the environmental review must extend beyond the specific reactor to the environmental effects of such reactors at large.

NRDC has asserted that it has no forum other than this proceeding in which the broad environmental studies it

[10] Citing the *Calvert Cliffs'* case.

seeks may be pursued. That is not the case. Each reprocessing plant has been and will be subject to the licensing procedures and standards established by the Commission's regulations, and in each such present and future proceeding a comprehensive analysis is being or will be made of its environmental effect. The Commission has procedures for rulemaking (10 CFR Part 2, Subpart H), under which the intervenors may by petition initiate rulemaking for the establishment of such regulations as they may choose to put forward. If in the judgment of the Commission it should be appropriate to resolve any specific questions which affect the industry as a whole, within the broad policy concerns which NRDC presents, then the rulemaking procedure is available.

Bearing in mind the purposes of the Environmental Protection Act, the Licensing Board will consider the extent to which the low level wastes, and the 65 cubic feet per year of resins which have a somewhat higher level of activity, will have an effect "significantly affecting the quality of the human environment" (National Environmental Policy Act of 1969, Sec. 102(2)(C), 42 U.S.C. 4332). In the exercise of the Licensing Board's discretion as to the extent to which evidence will be admitted or interrogatories allowed with reference to such subjects, it would be especially appropriate to limit inquiry to a level of detail appropriate to the character of the potential hazard associated with these wastes, so long as the Board has in its judgment an adequate basis for the required findings and conclusions (10 CFR Subsection 2.743(c)).

Evaluation of the environmental aspects of the ultimate depository of the high level wastes resulting from reprocessing is at this time speculative, because it has not yet been determined what the nature or the location of the ultimate depository will be. That project will also of course be subject to independent analysis and procedures in compliance with the Environmental Protection Act, and it cannot be the subject of appropriate evaluation in this proceeding.

The transportation of low level wastes to burial grounds was included within the scope of environmental review specified in the memorandum of the Director of Regulation dated September 1, 1971, and issued on September 3, 1971. Although that document does not have the effect of a binding regulation, we adopt it to that extent for the purposes of this proceeding. Since the operation of such burial grounds is licensed under other provisions of the Commission's regulations (10 CFR Part 30), the environmental aspects of each facility of that character may be considered in other proceedings.

The motion of NRDC included the request that the environmental study extend to the ultimate decommissioning and decontamination of the facility at the end of its useful life of about 40 years. The decommissioning and decontamination of power reactors have already been conducted within the framework of our licensing procedures, furnishing a practical basis for analysis.[11] The applicant has not opposed the inclusion of decommissioning and decontamination in the environmental study, the staff has considered it in its draft impact statement, and it may be considered in the Licensing Board's Findings and conclusions.

During the course of the hearing the Licensing Board raised the question that compliance with the objectives of the Environmental Policy Act does not explicitly fall within

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[11] *Matter of General Electric Company,* Docket No. 50–18; *Matter of Puerto Rico Water Resources Authority,* Docket No. 115–4; *Matter of City of Piqua, Ohio,* Docket No. 115–2.

the issues committed to the Licensing Board by the notice of hearing issued in this proceeding. This notice of hearing was superseded on March 1, 1972, with respect to environmental considerations by a supplemental notice of hearing which accomplished that purpose (37 Fed. Reg. 4733, (1972)).

Paragraph A(11) of Appendix D describes the functions to be performed by the Licensing Board with regard to the environmental statement and directs that its initial decision include findings and conclusions which may affirm or modify the contents of the final detailed statement prepared by the staff. The Licensing Board's findings and conclusions should of course be based upon all of the evidence before it (Administrative Procedure Act, Subsection 7(c), 5 U.S.C. 556(d)), and the evidence on which they will be based will very largely be in the record already. The extent to which further evidence may be required or appropriate is for the Board to determine in its discretion. The Board should allow such additional evidence as in its judgment is requisite to satisfy the purposes of the Environmental Policy Act and to support the findings and conclusions required by Appendix D, permitting only such additional evidence to be admitted as is in its judgment relevant, material, and reliable and not unduly repetitious (10 CFR Subsection 2.743(c)). The weight to be given to various environmental considerations is of course for the Board to consider.

It is therefore ORDERED:

1. So much of the motion of NRDC as requests that the substantive questions involved in the referral by the Atomic Safety and Licensing Board dated December 29, 1971, be referred to the Commission is denied;

2. Evidence as to the environmental effects of the transportation of irradiated nuclear fuel from the Vermont Yankee nuclear power plant to a reprocessing plant or other destination shall be admitted;

3. Evidence as to the environmental effects of the reprocessing of irradiated nuclear fuel, and the disposal of wastes resulting from reprocessing, shall not be admitted;

4. Evidence as to the environmental effects of the transportation of low level wastes, and of high level solid wastes other than irradiated fuel, from the reactor to depositories shall be admitted;

5. Evidence as to the environmental effects of the disposal of low and high level solid wastes shall not be admitted;

6. Evidence as to the environmental effects of decommissioning and decontamination of the facility at the end of its useful life shall be admitted;

7. The scope of the final environmental statement to be prepared by the staff, and of the findings and conclusions of the Licensing Board pursuant to 10 CFR 50, Appendix D, shall be consistent with the foregoing.

BY THE ATOMIC SAFETY AND LICENSING APPEAL BOARD,

WILLIAM L. WOODARD, *Executive Secretary.*

ALAB-179

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Dr. John H. Buck, Member
Dr. Lawrence R. Quarles, Member

In the Matter of

VERMONT YANKEE NUCLEAR POWER CORPORATION **Docket No. 50-271**

(Vermont Yankee Nuclear Power Station)

Mr. Anthony Z. Roisman and **Ms. Karin P. Sheldon**, Washington, D.C., for the intervenor New England Coalition on Nuclear Pollution.

Messrs. Richard Ayres and **David Schoenbrod**, New York, N. Y., for the intervenor Natural Resources Defense Council, Inc.

Mr. Thomas G. Dignan, Jr., Boston, Mass. (with whom **Messrs. Allen O. Eaton** and **John A. Ritsher**, Boston, Mass., were on the brief) for the applicant Vermont Yankee Nuclear Power Corporation.

Mr. Donald W. Stever, Jr., Assistant Attorney General, Concord, New Hampshire, for the State of New Hampshire.

Mr. Gregor I. McGregor, Assistant Attorney General, Boston, Mass., for the Commonwealth of Massachusetts.

Messrs. Kimberly B. Cheney, Attorney General, and **John R. Ponsetto**, Assistant Attorney General, Montpelier, Vermont, filed papers for the State of Vermont.

Mr. William Massar (with whom **Mr. Mark R. Haflich** was on the brief) for the AEC Regulatory Staff.

DECISION

February 28, 1974

We have before us for review the initial decision of the Licensing Board authorizing the issuance of a full-term, full-power operating license for the applicant's Vermont Yankee Nuclear Power Station, a boiling water reactor facility located on the Connecticut River near Vernon, Vermont.[1] Exceptions to that decision were filed by the New England Coalition on Nuclear Pollution (NECNP) and the Natural Resources Defense Council (NRDC), two intervenors in the proceeding.[2]

After hearing oral argument on the exceptions and on certain matters which we raised *sua sponte*,[3] we determined that prompt action on our part was necessary with respect to two safety-related matters. For that reason, we issued an opinion dealing only with those two subjects. ALAB-124, RAI-73-5 358 (May 23, 1973). By that decision, we remanded the proceeding to the Licensing Board for further consideration of (1) NECNP's motion to reopen the record (2) and the adequacy of the applicant's quality assurance program.

Because our action created a real possibility that the hearing record would be reopened on a number of subjects and that the initial decision would be altered, we deferred review of the initial decision and the remaining exceptions pending the outcome of the remand (*id.* at 359). We need

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[1] LBP-73-8, RAI-73-2 130. The applicant had previously been granted a temporary operating license for the facility, under the then-existing authority conferred by § 192 of the Atomic Energy Act, 42 U.S.C. 2242.

[2] The other principal parties — the applicant, the AEC regulatory staff and three New England States — filed no exceptions.

[3] See ALAB-120, RAI-73-4 268 (April 26, 1973).

not recount here the events which transpired after the initial remand. Those events are reflected in the numerous opinions which we have issued in the interim.[4] For present purposes, it is sufficient to state that the hearing was reopened for consideration of the fuel densification issue, the plant was derated pending the outcome of that reopened hearing, and only recently was the fuel densification problem finally resolved, allowing once again for normal operations.

The matters which were the subject of remand now having been resolved, we complete our review of the initial decision in this opinion. By way of introduction, we can point out that NRDC's twenty-seven exceptions focus primarily upon the adequacy of the cost-benefit analysis mandated by the National Environmental Policy Act, while NECNP's sixteen exceptions cover a variety of topics.[5] Some of the principal issues raised have been largely disposed of by decisions we rendered either at earlier stages of this proceed-

[4] After the initial remand, we issued the following published opinions: ALAB-126, RAI-73-6 393 (June 7, 1973); ALAB-131, RAI-73-6 427 (June 25, 1973); ALAB-138, RAI-73-7 520 (July 25, 1973); ALAB-141, RAI-73-8 576 (August 22, 1973); ALAB-167, RAI-73-12 1151 (December 20, 1973).

[5] While we wish to commend all parties on the quality of the briefs filed, we were particularly impressed with the manner in which NECNP presented its exceptions and supporting brief. Although governed by the former version of the rules (see 10 CFR (1973 ed.) 2.762), those filings achieved in full measure the goals of clarity and precision which the present version of the rules is designed to accomplish (10 CFR 2.762, as amended March 2, 1973, 38 *F.R.* 5624). The exceptions avoided the unnecessary multiplicity which has been a problem in certain recent cases. Moreover, it materially aided our consideration of the exceptions and our understanding of the parties' positions to have the exceptions related to a common topic grouped for briefing, with the text of the exceptions repeated at the beginning of the relevant portion of the brief (*cf. Long Island Lighting Co.* (Shoreham Station), ALAB-156, RAI-73-10 831, 832 (October 26, 1973). The assistance provided by all of the briefs was especially important in light of the complete absence of record references in the initial decision.

ing[6] or in other cases. Accordingly, we give those issues summary treatment in the initial portion of this opinion, and cover the other issues in more depth in the remaining portions.

I

ISSUES COVERED BY PRIOR DECISIONS

The issues which have been largely resolved by our prior decisions include the adequacy of the emergency core cooling system (ECCS) interim acceptance criteria (IAC); the adequacy of the treatment in this proceeding of "Class 9" accidents; the environmental impact of the fuel cycle; and the environmental impact of the uses to which the electricity produced in this facility will be put.

A. *ECCS.* NECNP asserts that it should not have been precluded from presenting evidence on the question as to whether the ECCS interim acceptance criteria, "if met,"[7] would "provide sufficient protection for the public health and safety." This issue had its genesis in NECNP's attempt to challenge the validity of the criteria on the dual grounds that their adoption was procedurally defective and that they were substantively unsupported. In response to a set of questions certified to us during the course of the hearing below, we held that the procedural objections were not well founded and that, in view of the pendency of a rulemaking proceeding at which the merits of the criteria were

[6] Prior to the issuance of the Initial Decision on the full-power, full-term operating license, this Board issued a number of decisions in response either to questions certified by the Licensing Board or to decisions on less than full power or less than full term operating licenses.

[7] The question as to whether the facility met the criteria was explored at the hearing, and NECNP eventually conceded (see App. Bd. Tr. 40) that the criteria were met (absent the subsequently revealed effect of the fuel densification phenomenon).

under consideration,[8] it would be inappropriate to consider the substantive objections in an individual licensing proceeding. ALAB-57, WASH-1218 435 (June 20, 1972); see also *Consolidated Edison Co.* (Indian Point 2), ALAB-46, WASH-1218 293 (March 10, 1972).

We see no reason to reexamine these holdings. Specifically, we find unavailing NECNP's assertion that ALAB-57 ignored the then-existing "Calvert Cliffs" principle. That principle permitted limited attacks upon the substantive validity of Commission regulations in individual licensing proceedings and established a method for presenting such an attack.[9] In announcing the "Calvert Cliffs" principle, however, the Commission did not have before it a situation in which there was pending — as there is here — a rulemaking proceeding concerned with the precise regulation under attack. And nothing in that decision indicates that the principle there established should be invoked if rulemaking were pending. The reasons expressed in ALAB-57 are sufficient to explain why it was appropriate not to invoke the "Calvert Cliffs" rule in this instance.

While we are thus rejecting NECNP's ECCS exceptions (numbers 1 and 2) on their merits, the applicant insists that those exceptions are procedurally defective as well, in that they involve matters not raised or preserved below. The applicant asserts that a comparison of the exceptions with the wording of one of NECNP's proposed conclusions of law

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[8] That rulemaking proceeding was recently concluded by the Commission's issuance of a lengthy decision announcing the adoption of acceptance criteria for emergency core cooling systems. CLI-73-39, RAI-73-12 1085 (December 28, 1973).

[9] The "Calvert Cliffs" principle was first articulated in the Commission's memorandum decision of August 8, 1969 in *Baltimore Gas and Electric Co.* (Calvert Cliffs Units 1 and 2), — AEC —. That principle has since been substantially modified by 10 C.F.R. 2.758.

demonstrates that the exception has a different thrust than the matters raised before the Licensing Board.

We agree with the applicant that NECNP never properly presented a claim that this facility was somehow different from other plants and for that reason the application of the IAC to it would not adequately protect the public health and safety. NECNP's claims were only that the criteria themselves were generally invalid (see NECNP Motion of March 6, 1972, and Statement of March 7, 1972). By the same token, however, we cannot accept the applicant's further insistence that NECNP has waived *all* ECCS contentions. As just indicated, NECNP quite clearly attempted to challenge the validity of the IAC. This Board unequivocally rejected its challenge at an interlocutory stage of the proceeding. Once that occurred, NECNP was under no obligation to file proposed findings of fact and conclusions of law on the subject of its challenge to the criteria — no further steps had to be taken to preserve its exception to the ruling rejecting its challenge to the validity of the criteria. *Cf. Consumers Power Co.* (Midland Units 1 and 2), ALAB-123, RAI-73-5 331, 333-34 (May 18, 1973).

B. *"Class 9" Accidents.* NECNP's exceptions 6, 7 and 8 are all based on its contentions below that, for reasons related to asserted ECCS ineffectiveness, the assumptions underlying the analysis of the environmental impact of a "Class 9" accident were improper). We recently had occasion to discuss a similar "Class 9" accident argument in some detail. *Long Island Lighting Co.* (Shoreham Station), ALAB-156, RAI-73-10 831 (October 26, 1973). There, after fully defining the term "Class 9" (*id.* at 834-835), we explained that the guidelines for treatment of such accidents in individual licensing proceedings did not, in general, "close the door to consideration of Class 9 accidents" (*id.* at 835). Rather, we explained, the parties would be permitted to

demonstrate the appropriateness of assumptions other than that utilized by the staff in the first instance, *i.e.*, that the particular accident under consideration had such a low probability that the environment risk is insignificant (*ibid.*).

Again, however, this general rule cannot be relied upon to legitimize an attempt to demonstrate a likelihood that the ECCS will not work. For, once it has been established that the facility complies with the applicable ECCS criteria, entertaining such an attempt would be the equivalent of entertaining a challenge to the ECCS criteria themselves. As we have already indicated, all such challenges were required to be deferred for consideration in the rulemaking proceeding. ALAB-57, *supra,* p. 161-162; see also ALAB-156, *supra,* RAI-73-10 at 847.

C. *Fuel Cycle.* By virtue of a ruling of this Board, both NECNP and NRDC were precluded from adducing evidence concerning the environmental impact of the fuel cycle. ALAB-56, WASH-1218 395 (June 6, 1972).[10] We decline the invitation, presented by their exceptions, to reexamine the validity of the reasons assigned in ALAB-56 in support of our refusal to permit inquiry into the effect of most aspects of the fuel cycle. For, regardless of the correctness of those reasons, we would, for another reason, have to reach the same result if faced anew with the question.

Specifically, shortly after the issuance of ALAB-56, the Commission initiated a rulemaking proceeding to consider the extent of the environmental impact of the fuel cycle and to ascertain how to weigh that impact in an individual licensing proceeding. See the November 15, 1972 Notice of Proposed Rulemaking on the Environmental Effects of the

[10] See also *Consumers Power Co.* (Midland Units 1 and 2), ALAB-60, WASH-1218 (Suppl. 1) 459 (July 19, 1972).

Uranium Fuel Cycle (37 *F.R.* 24191). Whatever doubt there may have been concerning the correctness of the result reached in ALAB-56 has been eliminated by the convening of that rulemaking proceeding. Once that proceeding was initiated, it would have been singularly inappropriate to undertake to duplicate it in an individual reactor licensing proceeding. See ALAB-57, *supra,* WASH-1218 at 443-44.[11] Thus, even in the absence of the Commission's express directive that we adhere to ALAB-56 pending the outcome of the fuel cycle rulemaking (37 *F.R.* at 24193), we undoubtedly would have done so. For this reason, and for the reasons expressed in the two *Shoreham* opinions (ALAB-99, RAI-73-2 53 and ALAB-156, *supra,* RAI-73-10 at 833), the fuel cycle exceptions (NECNP number 3 and NRDC numbers 6(i), 20, 24 and 25) are denied.[12]

D. *Consequences of the Use of Electricity.* In *Shoreham,* we also held that the consequences of the use of electricity produced at a nuclear facility should not be considered in an individual licensing proceeding. The reasons for that holding were articulated in some detail and are dispositive of NECNP's exception 4 filed here. ALAB-156, *supra,* RAI-73-10 at 852-54. See also *Nucleus of Chicago Homeowners v. Lynn,* — F. Supp. — , 6 E.R.C. 1094 (N.D. Ill., Nov. 21, 1973).

[11] The rulemaking proceeding is also a far more appropriate forum for the consideration of the environmental impact of the fuel cycle than is a proceeding concerned with the licensing of a particular reprocessing plant or waste disposal facility (*Cf.* ALAB-56, WASH-1218 at 404-06).

[12] NRDC's exception 27 touches on an aspect of the fuel cycle — i.e., transportation of spent fuel from the reactor to a reprocessing facility — concerning which inquiry may be made in an individual licensing proceeding. See ALAB-99, *supra,* RAI-73-2 at 54. Nothing in the unparticularized argument in support of that exception (Brief, p. 33), however, points to any "alternatives to 'normal' transportation procedures" which could "reduce the environmental risks" (*ibid.*). The exception is denied.

II

LOW-LEVEL RADIOACTIVE EMISSIONS

A. Two of NECNP's exceptions (numbers 9 and 10) concern the question of whether plant operations can be expected to comply with the requirement, embodied in 10 CFR 20.1(c), that "every reasonable effort" be made to maintain radioactive releases "as far below the limits specified in [Part 20] as practicable."[13] NECNP's claim that the staff and the applicant did not perform analyses adequate to demonstrate that releases would be kept "as low as practicable" focuses on two time periods: (1) an interim period prior to the scheduled installation of an improved off-gas system, and (2) the period thereafter, extending over the remaining life of the license.

With respect to short-term operation, NECNP argues that the Licensing Board misinterpreted the applicable regulation when it concluded that a "reasonable effort" consisted of promising to investigate the higher-than-expected releases which had occurred during operations under the temporary operating license while continuing to operate the plant. Turning to long-term operation, NECNP argues that the studies necessary to determine whether, on balance, the optimum system for control of radioactive releases had been chosen have never been performed. Accordingly, it urges, the record provides no basis for a determination as to whether the "as low as practicable" criterion has been met.

[13] A supplementary requirement, covering only facilities for which applications were filed after January 1, 1971, utilizes the terminology "as low as practicable." 10 CFR 50.34a(a). Both that term and the term used in 10 CFR 20.1(c) are defined as meaning "as low as is practicably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety and in relation to the utilization of atomic energy in the public interest." For convenience, and since both forms of expression have the same meaning, we use the shorter form — "as low as practicable" — in this opinion.

B. The Commission first formally adopted the "as low as practicable" requirement on December 3, 1970 (35 *F.R.* 18385). It later initiated a rulemaking proceeding to consider whether to adopt numerical standards, embodied in a proposed Appendix I to 10 CFR Part 50, which might define precisely a level of radioactive releases would be deemed to be "as low as practicable" in all cases (37 *F.R.* 11113, June 9, 1971).

In contrast to the course followed in connection with the ECCS rulemaking, the Commission did not require that there be adherence to any numerical guidelines during the pendency of the "as low as practicable" rulemaking proceeding, which is now in its final stages.[14] Thus, in the interim, it has been permissible to contend in an individual licensing proceeding not only that a proposed radwaste system will not perform as well as is claimed, but also that the level of releases which the system is claimed to achieve is not "as low as practicable" considering "the state of technology and the economics of improvement in relation to benefits . . ." (see fn. 13, *supra*). In other words, in the absence of interim numerical guidelines and until such time as Appendix I may be adopted, a contention that a proposed level of releases is not "as low as practicable" does not constitute an impermissible challenge to the regulations (compare our ECCS rulings, discussed at pp. 161-162, *supra*); instead, such a contention raises questions only of interpretation and application of the governing regulations.[15]

[14] On January 8, 1974, the rulemaking hearing board informed the Commission that the record was complete except for the filing of the participants' final statements of position. The last of those statements is due in early March, 1974.

[15] Of course, any claim that releases must be kept below "practicable" levels — *e.g.*, a claim that an available radwaste system improvement must be utilized without regard to cost or degree of additional radwaste control achieved — would constitute an impermissible challenge to the existing regulations, at least in the absence of the showing required by 10 CFR 2.758.

During this interim period, although precise numerical standards are not available, significant assistance in interpreting the "as low as practicable" standard is furnished by 10 CFR 50.36a(b). One purpose of that provision is to permit a degree of flexibility with respect to levels of releases under unusual operating conditions, but the provision also reflects the Commission's view that average annual releases "at small percentages" of Part 20 limits are achievable under normal operating conditions. While this language does not embody a precise standard and does not serve to preclude consideration in an individual licensing proceeding of a contention which focuses on the qualitative factors now reflected in the definition of "as low as practicable," it nonetheless provides an important guideline to be utilized in evaluating the merits of such a contention. More specifically, we believe it embodies a Commission view that a radwaste system which can be shown to achieve "small percentages" of Part 20 limits is *prima facie* in compliance with the regulations. And, as is customary, the presentation of a *prima facie* case shifts the burden of going forward to the adversary, *i.e.*, to those asserting that the proposed system is inadequate.[16]

Our conclusion, just stated, concerning the effect to be attributed to the "small percentages" language stems from an application of the fundamental principle of statutory construction which requires that, if at all possible, a statute be interpreted in a manner which gives effect to all its provisions. *Weinberger* v. *Hynson, Westcott & Dunning,* 412 U.S. 609, 633 (1973). Under that principle, the "small percentages" language cannot be entirely ignored. Yet, by the same token, it cannot be equated with a fixed numerical standard which would effectively supersede the qualitative standards set forth in 10 CFR 20.1(c) and 50.34a(a).

[16] See and compare *Midland,* ALAB-123, *supra,* RAI-73-5 at 345.

In sum, in order to give effect to all portions of the applicable regulations, we must regard a showing by the applicant and staff that the proposed system will achieve "small percentages" of Part 20 limits as constituting *prima facie* support for the proposition that the "as low as practicable" criterion has been satisfied. Under this view, while the ultimate burden of persuasion on the issue remains with the applicant, the burden of going forward with evidence is shifted to the opposing party. In other words, the applicant can rest on a showing that "small percentages" will be achieved; to succeed, an intervenor must then adduce its own evidence — which, of course, can include cross-examination of the other parties' witnesses — to show that even lower emissions are "practicable."[17]

C. Against this background, we can agree with NECNP that the question of compliance with the "as low as practicable" standard, pending installation of the advanced offgas system, deserved closer analysis than it received in the Initial Decision. Moreover, in light of the applicant's own statements on the last day of the hearing (Tr. 6127-52), we are perplexed by the rejection of NECNP's proposed subsidiary finding 9(a), regarding the leaking fuel rods, as "not supported by evidence in the record" (Initial Decision, p. 46, RAI-73-2 at 143).[18]

We are not now required, however, to resolve the question of short-term compliance. We have been advised that the

[17] We stress again that adoption of numerical guidelines defining what is to be regarded as "as low as practicable" — such as is contemplated by proposed Appendix I — would alter this situation.

[18] In ALAB-138, *supra,* we held that NECNP had not timely sought to reopen the hearing on the hydriding question, and that that question was not of such overriding safety importance as to excuse the untimeliness. RAI-73-7 at 526. That holding on the question of reopening was not conclusive as to NECNP's exception to the Board's resolution of the question of interim compliance, for the exception would turn on an evaluation of the evidence put in the record before the hearing closed.

advanced off-gas system has been installed. The issue is, therefore, moot.[19]

D. Turning to the question of compliance with the "as low as practicable" criterion in the long term, we note that the Board's opinion does not specifically address that contested issue. The evidence did, however, reveal that liquid releases were to be kept to 1% or less of Part 20 limits (Technical Specifications, as amended, 3.8.B.2, 3.8.F.1.b; Tr. 1865-66) and that, after the installation of the advanced off-gas system, gaseous effluents would be kept to 2% or less of those limits (Tr. 4432, 4438-39).

In our view, these values are within the range of the "small percentages" of Part 20 limits contemplated by 10 CFR 50.36a(b).[20] The applicant having thus presented a *prima facie* case, the burden then shifted to NECNP to show that even lower levels were "practicable," all factors considered. NECNP began an inquiry apparently directed to that end, and succeeded in eliciting evidence to the effect that the applicant had not examined the feasibility of certain alternatives mentioned by NECNP's counsel (Tr. 1866-99, 1938, 1950-51). While this perhaps launched NECNP's inquiry in the proper direction, those concessions do not, standing alone, suffice to rebut the applicant's *prima facie* case. In our view, to succeed NECNP had to show not only that the applicant had not investigated certain hypothetical alternatives, but also that those alternatives were indeed "practi-

[19] The applicant installed the advanced system during an outage which occurred while we were concerned with those issues which, because of their significant safety implications, we had singled out for rapid disposition. See fn. 4, *supra*. In this regard, we should note that NECNP did not submit to us a request for a stay of the Initial Decision pending our consideration of the propriety of operations during the period prior to installation of the advanced system.

[20] In view of the mootness of the issue of interim compliance, we need not decide whether the expected short-term off-gas releases of 10% of Part 20 limits were within the "small percentages" range.

cable" ones. There is no such showing in the record, and accordingly there is no basis for a holding that the applicant's proposed system, which limits releases to small percentages of Part 20 limits, can be improved upon in a "practicable" manner.

III

COOLING TOWER OPERATION

A. The flow of condenser cooling water for this facility can be regulated so that cooling is accomplished by one of three possible methods — once-through, or open cycle, cooling, in which the total flow is discharged directly to the river; closed cycle, in which the total flow passes through the cooling towers and is recirculated; and helper cycle, in which the amount of flow through the cooling towers and the amount of water recirculated can be varied. The applicant proposed to utilize the closed system at certain times, varying its operation according to the prevailing conditions. Without downgrading the need to prevent thermal pollution of the river, the intervenors pointed out that cooling tower operation itself could be environmentally degrading through creation of excessive fog or noise.

The Board found that little, if any, environmental insult would result from the operation of the towers. With respect to the noise problem, it found that "the surveys made of the noise levels indicate that they are acceptable." Initial Decision, p. 15, RAI-73-2 at 134. The Board then determined that, at least for an extended period, all operations must be under the closed cycle mode. Its reasons for doing so were as follows (Initial Decision, pp. 27-28, RAI-73-2 at 138):

> . . . the Board concludes that there are insufficient data respecting the existing ecosystem of the Connecticut River adjacent to the nuclear plant site to permit thermal or chemical releases into the river at this time, beyond the

minimal releases resultant from closed cycle operation, that more data from a more comprehensive effort than heretofore undertaken, should be developed so that the feed stock of the river can be determined, the effects of thermal and chemical releases can be analyzed, the species and number of fish affected can be approximated, seasonal effects determined, and other relevant matters developed. The Board determines that, as a suitable alternative that will not cause significantly adverse environmental impacts, Applicant should operate with closed cycle operations at all times until these data are developed and determinations made respecting significant adverse impacts on the environment by the advisory group for non-radiological environmental monitoring, which group is established in section 2.2.2 of the Technical Specifications. The Order of the Board for closed cycle operations herein will so provide, in order to protect the ecosystem before possible injurious effects have occurred and in order to reduce fish kill and damage to zooplankton and phytoplankton. . . .

Based on this statement, the Board imposed the following as Condition A to the license (Initial Decision, p. 53, RAI-73-2 at 146):

> Applicant shall operate the nuclear power facility with closed cycle operations at all times until data are developed and determinations made respecting significant adverse impacts on the environment by the advisory group for non-radiological environmental monitoring, which group is established by section 2.2.2 of the Technical Specifications dated September 9, 1972 as further modified by Staff change dated December 27, 1972.

The applicant did not take exception to the imposition of this condition and, under our rules, thus waived any objection. 10 CFR (1973 ed.) 2.762(a). NECNP, however, filed an exception to the Board's resolution of the noise issue, asserting that "it was error to conclude that the operation of the cooling towers at Vermont Yankee would create noise levels that would always be acceptable" (Exception No. 13). We viewed this exception as presenting at least an indirect

challenge to the Board's holding that, owing to environmental considerations other than noise, all operations must be in the closed cycle mode. At the same time, we were unsure of the precise meaning of Condition A. In terms, it required closed cycle operations until "data . . . respecting significant adverse impacts on the environment" were obtained. But, we thought, complete data of that nature could not be obtained without conducting at least some once-through operation and measuring its effects. And such operation appeared to be precluded by Condition A.

For these reasons, we raised *sua sponte* and directed the parties to discuss at oral argument the following question (ALAB-120, *supra,* RAI-73-4 at 268):

> Whether the Board's requirement . . . that the plant operate with cooling towers at all times until relevant data are collected:
>
> (a) will prevent the collection of data related to the effects of once-through operation; and
>
> (b) embodies the most appropriate alternative, from an environmental standpoint, for dissipating the waste heat generated by plant operation.

The first part of that question was, of course, suggested by the procedural dilemma we thought had been created by the wording of Condition A; the second part had been suggested primarily by the probability that, if NECNP's "noise" exception were well taken, the noise problem might outweigh the other environmental considerations relied upon by the Licensing Board.

B. We have concluded that no modification of the Board's resolution of the noise issue is warranted. We have also concluded that it is appropriate to clarify Condition A to reflect unambiguously what we, and all the parties, believe to be its intent. In light of these conclusions, and in the

absence of any exception directed to the substance of Condition A, no further examination of the matter of cooling tower operation is warranted.

1. We agree with the applicant that, contrary to the view expressed in NECNP's exception, the Board did not hold that noise levels "would always be acceptable." Rather, the Board held only that the information then available indicated that the noise levels were generally acceptable, but that continuing monitoring would be conducted and that, based on the results of that monitoring, modifications might later be deemed necessary. The Board's decision in this respect is a perfectly reasonable one in light of the evidence,[21] and we have found no basis for disturbing it. In this connection, we wish only to reemphasize that the staff should give careful consideration to the results of the monitoring, so that, if necessary, steps may be taken to reduce the impact of tower noise upon nearby residents and upon the educational process at the nearby school.

2. At the oral argument, each of the parties agreed that the principal concern which led the Board to impose Condition A was the absence of adequate base-line environmental data, and that the Board's intention was that once the base-line data were obtained, consideration could be given to conducting open-cycle or helper-cycle operations. In other words, the terminology employed in Condition A was intended to result first in the acquisition of adequate base-line environmental data; then the analysis of that data by the advisory group and a prediction of whether closed-cycle operation will result in "significant adverse impact on the

[21] See the affidavit of John T. Collins (ff. Tr. 5268) and the supplementary testimony of J. E. Kruck (ff. Tr. 5297). Although in some respects the sound levels in the school building with the windows open slightly exceeded recommended levels, in Mr. Collins' opinion this would not interfere with normal classroom discussion (Affidavit, par. 8.e. and 8.g.).

environment"; followed by, if justified, the grant to the applicant of temporary authorization to depart from closed cycle operations for testing purposes and, finally, permanent authorization to conduct other than closed cycle operations under particular conditions.

On that basis, the substance of Condition A is acceptable. Consequently, as each of the parties which addressed the issue agreed was appropriate,[22] we need only amend the language of that condition to reflect more accurately its substance (see p. 186, *infra*).

3. Our resolution of any doubts concerning the noise issue and our clarification of the meaning of Condition A removes the concerns that motivated us to raise the question of the appropriateness, from an environmental standpoint, of closed cycle operation. In other words, since we agree with the Board's discussion of the noise problem and share its view that additional base-line environmental data must be gathered, there is no basis for disturbing the requirement that only closed cycle operations would be permitted until the necessary base-line data were obtained.

IV

NRDC'S CLAIMS CONCERNING THE ADEQUACY OF THE ENVIRONMENTAL IMPACT STATEMENT

A. The basic claim made by NRDC, both in the proceedings before the Licensing Board and in the exceptions filed with us, is that the environmental impact statement, and in particular its cost-benefit analysis, does not comply with "the standards set forth by NEPA and the Commission" (Brief in Support of Exceptions, p. 1). The individual ex-

[22] See App. Board Tr., pp. 57-62, 70, 75, 189.

ceptions relating to this claim arose out of the following circumstances.

1. The final environmental statement (FES) prepared by the staff and issued in July 1972,[23] was introduced into evidence at the outset of the last, and largely environmental, session of the hearing. On the last day of that session, the staff presented for cross-examination Dr. Paul C. Fine, who had participated in the preparation of the FES (Tr. 6158-59). The parties cross-examined Dr. Fine extensively; in particular, NRDC — which had had no representative present on the earlier days of the final session — conducted lengthy cross-examination (Tr. 6223-99, 6309-11).

Perhaps the principal cost-benefit contention which NRDC advanced before the Licensing Board was that the FES did not sufficiently quantify or specify in monetary terms the costs and benefits associated with facility operation. NRDC's most serious concern in this respect was the failure to place a dollar value upon the benefit received by the public from the electricity to be produced by the facility.

The Board's decision on the question of the adequacy of the cost-benefit analysis was to "accept the several costs and benefits assessed by the Staff" with certain modifications (Initial Decision at 29, RAI-73-2 at 138). The principal modification stemmed from the Board's finding that, while the staff had for the most part "quantified all items in dollars to the extent possible . . . ," it had improperly failed to do so with respect to the electricity to be produced (Initial Decision at 31, RAI-73-2 at 139). In that connection, the Board held that the monetary value of the benefit of the

[23] The applicant had submitted an environmental report in August, 1970. That report was supplemented in December, 1971. The staff's draft environmental statement was issued for comment in April, 1972. The FES contains copies of the comments submitted in response to the draft statement, as well as the staff's response to those comments.

electricity could be determined by multiplying anticipated energy production in kilowatt hours by the average retail rate of 2.18 cents per KWH (Initial Decision at 32-34, RAI-73-2 at 139-40).[24]

2. NRDC's exceptions assert that, in a number of respects, the environmental impact statement, and particularly its cost-benefit analysis, is inadequate even as modified by the Board.[25] Many of the asserted defects are said to have been present in the staff's cost-benefit analysis and not corrected, or not susceptible to correction, by the Licensing Board. In spite of its insistence that the Board place a monetary value on the benefit accruing from the electricity produced, one group of NRDC's exceptions (numbers 13, 14, 15 and 22) objects to the Board's actions in that regard as being beyond the scope of the Board's authority, lacking in evidentiary support, and arbitrary in other respects.

The question as to whether, and if so how, the value of electricity should be calculated for consideration in an environmental impact statement is a significant and recurring one. As indicated above, NRDC urged that computation of a monetary value was required, but has excepted to the Board's performance of that task. We have reviewed the Board's treatment of the issue on a plenary basis, that is, not only in light of NRDC's specific complaints but also in the exercise of our broad authority to review from all stand-

[24] The Licensing Board did not undertake to perform that calculation itself, although under its view the result of the calculation would be a significant factor in the cost-benefit analysis.

[25] Commission regulations treat initial decisions by licensing boards, and appellate decisions issued by us or by the Commission, as *pro tanto* modifications of the FES. To the extent that they deal with environmental matters, such decisions stand as modified versions of the environmental impact statement required by NEPA and are transmitted to the Council on Environmental Quality; in addition, notification of their issuance is placed in the *Federal Register*. 10 CFR Part 50, Appendix D, Section A.11.

points the correctness of all aspects of an initial decision (see ALAB-124, *supra*, RAI-73-5 at 361).

B. We have concluded that the placing of a monetary value on the benefit of electricity is not mandated either by NEPA or by Commission regulations, and that attempting such a task serves no useful purpose. If anything, the appearance of precision resulting from such an exercise tends to divert scrutiny from the difficult judgmental decisions involved in performing an accurate cost-benefit analysis and, specifically, in determining whether a genuine need for the facility exists. Accordingly, we are vacating the modification concerning the dollar value of electricity made by the Board to the cost-benefit analysis.

1. We agree in full measure with NRDC's major premise that environmental impact statements should quantify costs and benefits to the fullest extent practicable, and do so in monetary terms. While the principal focus of judicial decisions has been on the quantification of environmental costs, we have no doubt that equal attention should be paid to the quantification of the benefits sought to be achieved by a proposed project.

The question remains, however, of the extent to which a meaningful dollar value can be placed on the benefits accruing from the licensing of electric generating facilities. Quantification is, of course, practicable in describing the amount and reliability of the electricity to be produced. Assigning a dollar value to represent the resulting benefit is, however, a different matter. It may be that, for some types of projects subject to NEPA, some of the benefits can be described meaningfully in monetary terms. But the benefits achieved from the generation of electricity cannot be so described.

To be sure, the formula adopted by the Licensing Board is attractive for its simplicity. Calculating the product of two factors — KWH × average retail rate — yields an apparently precise dollar value for the "benefits" of the project in terms of electricity produced. The attractiveness of this method is, however, only superficial. Closer analysis reveals its shortcomings.

In the first place, the record provides no basis — and we are aware of none — for an assumption that the value of having electricity available is no more than the retail price which a consumer of that electricity presently pays for it. The value to society derived from being able to meet a real demand for electricity is not measurable in dollars. If the electricity to be produced by a proposed project is genuinely needed — a point which we focus on later in this opinion and which deserves close scrutiny in hearings — then the societal benefits achieved by having that electricity available are immeasurable.

In other words, given the structure of our exising society, the alternative of not meeting real demand is unthinkable. Life as we know it — indeed, the present population itself — could not be supported without electricity. In that context, and to the extent that demand is inelastic, the value of electricity cannot be measured by the amount of the bill received by the consumer — it is, in a real sense, "priceless".

In short, the dollar value which the Licensing Board would place on the benefits of electricity is, in our judgment, not an accurate, or meaningful, one.[26] Nor is it particularly

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[26] Although, in its papers before us, the applicant appears to support the Licensing Board's approach (Brief in Opposition to Exceptions, pp. 50-53), its position before us may have been influenced by the fact that it was in the applicant's interest to defend the result reached by the Licensing Board. We find more convincing the applicant's insistence at oral argument before the Licensing Board that there exists no meaningful method

useful in attempting to construct a cost-benefit analysis. For example, the Licensing Board indicated that the average retail rate, which it utilized in calculating what it said were the "benefits", also reflected — by virtue of the nature of the rate-making process — the costs involved in producing those benefits (Initial Decision at 33-34, RAI-73-2 at 140). But NRDC, carrying this analysis to its logical — but admittedly absurd — conclusion, points out that under this approach the "benefits" of the proposed project are equivalent to the economic costs and thus economic and environmental costs together necessarily outweigh the "benefits" (Brief in Support of Exceptions, pp. 21-22). This points up the lack of meaning and utility in the Licensing Board's computation of a dollar value for benefits of electricity.

The same deficiencies can be seen from a slightly different viewpoint. The Board did note that some small portion of the retail rate — "perhaps .002 cents" — reflects profit or return on investment (Initial Decision at 34, RAI-73-2 at 140). Under this approach, "benefits" evaluated in terms of the retail rate would exceed the economic costs. But the amount of the excess of benefits over cost, supposedly a measure of the net "benefit" of the project, would in reality represent nothing other than the profitability of the utility's operation. As such, then, it is not a true measure of net "benefit", for surely there is little, if any, correlation between the profitability of the project to investors and the benefit of the project to society. Similarly, if a state elected to establish non-profit entities to produce electricity for its residents, it would not follow from the equivalency of re-

for placing a monetary value on the electricity to be produced (Oral Argument, Tr. 223-24). In that connection, we disagree with the inference drawn by the Board "that [the] Applicant contemplated that the value of electricity could be expressed . . ." in the manner the Board selected (Initial Decision at 32, RAI-73-2 at 139).

ceipts and costs that no net "benefit" accrued from the production of electricity.

2. No party has pointed to a suitable method for placing a dollar value on the benefits of electricity, and, in line with our discussion above, we believe none exists.[27] In the absence of such a method, the NEPA cost-benefit balancing must proceed along different lines.

In this connection, NRDC relies upon judicial decisions which, it asserts, establish a requirement that a cost-benefit analysis measure not just the costs and benefits of alternatives to the project, but the costs and benefits of the project itself.[28] But none of those decisions contained a full discussion of the application of that general principle concerning

[27] Throughout the Board's opinion and NRDC's brief, heavy reliance is placed, for the proposition, *inter alia*, that a monetary value must be placed upon electricity, upon the May 1972 "Guide for Submission of Information on Costs and Benefits of Environmentally Related Alternative Designs for Defined Classes of Completed and Partially Completed Nuclear Facilities". We note also that Regulatory Guide 4.2, entitled "Preparation of Environmental Reports for Nuclear Power Plants", issued in March 1973, states that the benefits of the electricity to be generated "should also be expressed in dollars by showing expected average annual revenues [with the] basis of assigning dollar values . . . clearly stated". § 8.1, p. 4.2-33.

In order to avoid any confusion on this score, we should observe that guides such as those referred to represent the thinking only of the regulatory staff, not the Commission itself. Indeed, an express disclaimer to that effect appears in Regulatory Guide 4.2, and the May 1972 Guide contains a statement (p. i) that it is "supplementary to the draft" which eventually led to the issuance of Regulatory Guide 4.2. In short, the documents are useful as guides; but they are not regulations and, insofar as the adjudicatory process is concerned, they represent only the opinions of one of the parties to that process and as such cannot be viewed as necessarily controlling. For its part, then, the Licensing Board attributed more significance to the statements in the Guide than was warranted. For our part, the portion of § 8.1 of Regulatory Guide 4.2 quoted above does not alter our conclusion concerning the inutility of attempting to assign a dollar value to the benefits of electricity.

[28] See *NRDC* v. *Morton*, 458 F.2d 827 (D.C. Cir. 1972); *Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F.2d 1109 (D.C. Cir. 1971); *EDF* v. *Corps of Engineers*, 470 F.2d 289 (8th Cir. 1972).

the implementation of NEPA to the licensing of electric generating facilities. It is appropriate, then, for us to set forth our own view as to the steps which should be followed in conducting a NEPA review of a proposed nuclear-powered electric generating facility.

At the outset, inquiry must be made into whether there exists a genuine need for the electricity to be produced. This inquiry involves not only an analysis of existing generating capacity and of projections of expected growth, but also consideration of the possibility that measures to curtail consumption will be initiated. In this regard, appropriate attention must be given to energy conservation considerations, insofar as they affect the likelihood that predicted demand will in fact ocur.[29] At the same time, however, cognizance can be taken of the effect which a shortage of fossil fuel, or a need to divert that fuel to other uses, might have upon demand for non-fossil fueled generating sources.

On the basis of this information, a preliminary decision can be made as to the extent to which some form of generating facility appears to be justified. Even a decision favorable to the applicant on this score does not, of course, mean that a proposed nuclear facility designed to meet the predicted demand will pass muster. The Commission must still examine the proposal in light of all of NEPA's purposes. At that stage, however, the focus shifts to the relative costs and benefits of alternatives to the proposed facility. Consideration of alternatives to the proposed project must be wide-ranging, embracing, *inter alia,* alternative

[29] The Commission has, in two recent decisions, emphasized that full consideration must be given to appropriately framed energy conservation contentions. *Niagara Mohawk Power Corp.* (Nine Mile Point Unit 2), RAI-73-11 995; and *Consumers Power Co.* (Midland Units 1 and 2), RAI-74-1 19.

generating methods, alternative sites,[30] and alternative auxiliary equipment (*e.g.,* cooling towers). Consideration of these subjects requires a comparison of the relative benefits achieved and costs incurred under each of the alternative proposals, so that the optimum alternative may be selected.

Finally, an overall balancing of costs and benefits occurs, but it is not necessary for this purpose to attempt to place a dollar value on the benefits of the electricity to be produced. Instead, on a qualitative basis, the costs associated with the optimum alternative selected must be balanced against the benefit achieved by meeting the degree of demand anticipated. To be sure, if the facility will satisfy a real demand for electricity that cannot be met by the purchase of power from other systems, then the result of the balancing may be a foregone conclusion in that, as indicated above, the alternative of not meeting the demand is unthinkable.

For the reasons stated, we are compelled to vacate that portion of the initial decision requiring the assignment of a dollar value to the benefits of electricity. Having done that, NRDC's exceptions to the precise manner in which the dollar value was to be assigned (see p. 172, *supra*) are no longer of consequence. Moreover, NRDC's broad objection to the effect that no overall balancing was undertaken (exception 2) must be rejected, since what NRDC views as a "pretense at balancing" (Brief, p. 10) comports with our broad outline of the steps to be followed in fulfilling the purposes of NEPA.

[30] See, *e.g.,* the October 5, 1973 letter from the Director of Regulation to the applicant in Docket Nos. 50-354 and 50-355, *Public Service Electric & Gas* (Newbold Island), stating that "an important requirement in the preparation of an environmental impact statement for a nuclear power plant is, of course, a consideration of alternative sites" and concluding that an alternative location was "a more desirable alternative from an environmental standpoint."

C. The preceding discussion of those of NRDC's exceptions relating to the monetary value of the benefits of electricity touched, in the broadest terms, on the general content of environmental impact statements. In this section, we consider NRDC's remaining exceptions, which assert that there were a number of defects in the environmental impact statement for this particular facility.

1. NRDC's claim that the cost-benefit analysis was "unsystematic and lacked rigor" (exception 1; Brief, p. 7) rests on two narrow assertions: (1) while costs and benefits should have been kept separate, there were "two examples where alleged benefits appeared in the cost section", and (2) "the text of the cost section on the proposed action is randomly interspersed with some but not all of the costs and benefits of some of the alternatives" (Brief, p. 7).

We agree in principle with NRDC's contention that a systematic approach must be brought to bear on the complex questions and decisions involved in conducting and describing a cost-benefit analysis related to a proposed nuclear facility. But examination of the portions of the record referred to by NRDC reveals that the deficiencies allegedly present here are of a minor nature. They stem, not from inadequacies in conducting the cost-benefit analysis, but rather only from the selection of an inartful method of describing some of the relatively insignificant results of that analysis. Contrary to NRDC's claim that their effect has been the "shielding [of] the decision-making process behind a smoke-screen of confusion" (Brief, p. 9), these deficiencies do not prevent the reader of the FES either from gaining a clear understanding of what is involved or from framing a challenge to the facts contained or conclusions expressed therein. Thus, while this exception has some validity in principle, no substantive modifications of the envrionmental statements are called for.

2. By another group of exceptions (numbers 3, 4, 5, 6(ii)-6(v), and 21), NRDC argues that the magnitude of the costs of the project were not disclosed by the environmental impact statement. Specifically, claims NRDC, certain costs were either omitted entirely, not identified with particularity, or not monetarily quantified to a sufficient degree.

NRDC's principal argument in this respect concerned the cost of the fuel cycle, which we have already discussed in connection with NECNP's exceptions *(supra,* pp. 163-164). It also placed heavy emphasis, however, on the allegedly inadequate consideration given to the several types of emissions from the plant, and suggested that a dollar value could readily have been assigned to the adverse environmental impacts of those emissions by considering their effect upon real estate values.

Unlike the claim that the benefits from electricity produced can be represented by a dollar value, NRDC's suggestion concerning consideration of changes in real estate values as a measure of costs holds out some promise. If plant emissions do have an effect on real estate values, measuring that effect would provide a useful, meaningful method for evaluating some of the costs associated with facility operation. But the only evidence in the record on this point was provided by a staff witness whose statements, on cross-examination, appear to indicate that he did not know how the effect, if any, of emissions on real estate values could be measured in the circumstances presented here (Tr. 6174, 6200, 6281, 6286-87). In the face of that testimony, it was incumbent upon NRDC to adduce evidence of its own to demonstrate that its suggestion was, indeed, a workable one. In the absence of such a demonstration, we must proceed on the basis of the uncontradicted testimony rejecting real estate evaluation as a useful tool in this case. The exceptions are denied.

3. A third group of exceptions (numbers 7, 8, 9, 10, 16, 17 and 18) reflects NRDC's view that confusion existed with respect to the "issues concerning secondary benefits" (Brief, p. 16). The short answer to these exceptions is that, as a staff witness pointed out, the secondary benefits listed in the FES (*e.g.*, local taxes and local employment) were mentioned only for informational purposes and did not play a part in the decision to proceed with the proposed project (FES, p. XI-14, par. B.8; Tr. 6175, 6198-99, 6290-91). Because many of the "secondary benefits" consist of transfer payments resulting in offsetting costs and benefits, we agree with the staff and NRDC that they have no place in the overall evaluation of the appropriateness of the project.[31]

4. As we discussed in connection with the reasons why the assignment of a monetary value to the benefits of the electricity to be produced is unnecessary, an environmental impact statement must contain a thorough analysis of alternatives. NRDC asserts that the cost-benefit analysis for this project reflects an inadequate treatment of alternatives (exception 23; Brief, p. 22). Its sole argument in support of this assertion runs along the following lines: (1) the alternative most fully considered in the FES was closed cycle cooling; (2) the Board found this alternative to be inadequately treated, and (3) "it follows" that the staff's less thorough discussion of other alternatives is also below the requisite standards.

The difficulty with this argument is that the Board rejected the staff's conclusion with respect to the closed cycle cooling alternative not because the staff's discussion was inadequate, but because the Board disagreed, *on the merits,*

[31] The Licensing Board modified the FES by "classifying local taxes as a benefit, rather than as a cost which the Staff considered [them to be]" (Initial Decision at 38, RAI-73-2 at 141). Our reading of the FES and the relevant testimony does not, however, reveal that the staff treated local taxes as a cost. In any event, in light of our discussion in the text, above, this "modification" embodies no error warranting corrective action.

with the staff's conclusions. Stated otherwise, the Board believed, based on its evaluation of the facts, that a different alternative than the one selected by the staff should be adopted. From this, it does not "follow" that the conclusions reached by the staff with respect to possible alternatives in other areas should also be rejected, even if the discussion of those alternatives was abbreviated. The question is whether, on the merits, different conclusions with respect to those alternatives should be drawn. Except with respect to the early installation of the off-gas system (discussed in Part II of this opinion, *supra*), NRDC has pointed to no specific deficiencies in the discussion of alternatives, and no evidence indicating that an improper evaluation of alternatives was made. No further inquiry into the question of alternatives is warranted.[32]

5. The final point deserving discussion is NRDC's claim that the staff offered no expert testimony on cost-benefit analysis. This claim is based on NRDC's view that the staff witness, Dr. Paul Fine, was not an expert (Exception 12; Brief, pp. 19-20).

This argument suffers from a number of procedural and substantive defects. In the first place, no objection to Dr.

[32] In addition to its general exception on the question of alternatives, NRDC did file an exception (number 26) directed to the assertedly inadequate discussion of alternative means of decommissioning the facility. But any additional discussion of alternative methods of decommissioning would have been an idle exercise. Decommissioning will not take place for some forty years and, in our judgment, nothing would be less profitable than attempting to evaluate now what method of decommissioning will be deemed most desirable forty years from now, in light of the knowledge which will have been accumulated by that time. And, while NRDC in its Brief (p. 33) calls for an examination of "means of lessening the impact of decommissioning," we are not aware of any measures, and NRDC has pointed to none, that could have been taken in the latter stages of construction that would have lessened the impact of whatever form decommissioning eventually takes. NRDC presented nothing to indicate that the nature of the inquiry it is calling for would be other than entirely speculative and hypothetical. In that circumstance, there was no basis for undertaking such an inquiry.

Fine's qualifications to offer expert testimony was made either when he first appeared or after he concluded his testimony. Indeed, it was not until briefs were filed some forty days later that the question was first raised. Permitting such a late challenge to the qualifications of an expert would be seriously prejudicial to the rights of the party on whose behalf the expert appears and to the orderly conduct of hearings. In administrative hearings and judicial trials, if one "expert" put forth by a party is rejected as not qualified on the basis of a timely challenge, that party may wish to attempt to qualify a different witness to testify as an expert on its behalf. If a meritorious challenge to the qualifications of a witness is permitted to be withheld until after the taking of evidence is concluded, then one of two undesirable results would follow: either (1) the party sponsoring the witness would be deprived of its opportunity to present a different expert; or (2) the hearing or trial would have to be reopened to afford the sponsoring party that opportunity. Neither result would be tolerable. In the absence of a justification for the delay in bringing the challenge, NRDC's challenge must be rejected as untimely.[33] Specifically, to the extent that the claim of inexpertise goes to Dr. Fine's background, training and experience, that claim should have been raised on voir dire. And to the extent that the claim is founded on testimony given by Dr. Fine which, according to NRDC, documented his lack of expertise, that point should have been raised as the testimony unfolded or at the

[33] See McCormick on Evidence, § 70, pp. 149-50: ". . . when the witness is first called to the stand to testify, the opponent must then challenge his competency, if grounds of challenge are then known to him. If not then known, and the cause for disqualification is disclosed in the testimony the challenge may then be made." [footnotes omitted]

time it was concluded, rather than forty days after the hearing closed.[34]

In any event, we think NRDC has failed to establish a lack of expertise on Dr. Fine's part. To the contrary, NRDC itself draws heavily on the opinions expressed by Dr. Fine as support for many of the positions taken in the brief filed in support of its exceptions (see, *e.g.*, Brief, pp. 4-7, 9, 12, 15, 17). And examination of the portions of the transcript which NRDC relies upon as demonstrating Dr. Fine's "confusion" reveals, at most, that Dr. Fine held and expressed opinions at variance from those held by NRDC's counsel. This provides no basis for a determination by us that Dr. Fine lacked the requisite expertise. If it disagreed with his views, the burden was on NRDC to adduce evidence, through experts of its own or some other means,

[34] At oral argument before us, NRDC referred to the procedure utilized in connection with the admission of the FSAR into evidence as justifying the failure to challenge Dr. Fine's entitlement to expert status in a timely manner (Appeal Board Tr. 101-02), 216-17). Having examined the procedure referred to, we have concluded that the Licensing Board's sanctioning of it in no way furnished justification for the course followed by NRDC with respect to Dr. Fine's testimony.

When the FSAR was offered into evidence, some doubt arose as to whether its initial admission into evidence would be viewed as an expression of approval of its contents, and, concomitantly, whether a refusal to object to its admission would constitute waiver of the right to challenge the validity of its contents (see Tr. 585-610). Thus, the Board had to face the question as to whether (1) to admit the FSAR, subject to cross-examination of the sponsoring witnesses and, possibly, a subsequent motion to strike all or part of it, or (2) to withhold ruling on its actual admission pending inquiry into the validity of its contents. As was well within its discretion, the Board determined to follow the former procedure (Tr. 610). A similar procedure appears to have been followed with respect to the admission of the FES (see Tr. 5238-60). But this meant only that, after the FES was admitted, NRDC retained the right to attack its contents through the introduction of further evidence. By thus permitting challenges to the contents of documents to be deferred, the Board in no way relieved NRDC of the obligation to raise in a timely manner objections which it may have had to the qualifications of subsequent witnesses.

tending to show that Dr. Fine's expressed opinions were of such a nature that they called his expertise into question.[35]

V

MISCELLANEOUS ISSUES

A. *Energy Conservation Alternatives.* In its proposed conclusions of law, NECNP pointed to the failure of the Final Environmental Statement to consider, as an alternative to full power operation of this facility, the use of energy conservation measures. In particular, NECNP claimed, the FES did not discuss the elimination of promotional advertising and the redesign of the electric rate structure (Proposed Conclusion 1(b)). The Board rejected the proposed conclusion, without specific discussion (Initial Decision at 47, RAI-73-2 at 144). NECNP's exception 5 asserts that insufficient attention was given to energy conservation. As indicated by our earlier comments (p. 175, *supra),* the general principle advocated by NECNP is a sound one. As previously noted, the Commission has made it plain that energy conservation contentions have a legitimate place in licensing proceedings (see fn. 29, *supra).*[36]

At the time the National Environmental Policy Act was passed, however, this facility had been under construction for two years. At the time the FES was written, the facility was nearly ready for operation. Whatever impact the evaluation of energy conservation measures might have had at the time construction permits were under consideration will be considerably lessened, if not eliminated entirely, at

[35] In light of our denial of NRDC's other exceptions dealing with the environmental impact statement, we deny exception 11, which was not separately briefed and which only summarizes points NRDC made elsewhere.

[36] The Federal Power Commission had adopted a similar policy. See its "Guidelines for Preparation of Applicants' Environmental Reports," par. 8.2 (38 *F.R.* 15944, 15949, 15952, June 19, 1973).

the operating license stage. NECNP itself appears to recognize this, for its energy conservation argument seems to seek, not a ban on facility operations entirely, but only the imposition of limitations on operation during periods when such operation would allegedly be harmful from a radiological or environmental standpoint (Brief, pp. 8-9). As illustrative examples, it suggests *(ibid.)* that utilization of energy conservation measures might permit the imposition of (1) restrictions on operations at times when operational noise is affecting the educational process at a nearby school, or (2) a ban on operations pending the installation of the improved gaseous radwaste system (see Part II, *supra).*

Under the circumstances presented here, there was no occasion for a discussion in the FES of the particular suggestions NECNP now advances as a means of reducing demand. NECNP's comments on the draft environmental statement did not mention these ideas except by way of the very general criticism that "ways of reducing demand are not analyzed" (FES, A-144). Moreover, although not precluded from doing so, NECNP put in no evidence of its own to demonstrate that adoption of such measures would indeed allow more flexibility to impose restrictions on operations at appropriate times. Consequently, the Board would not be expected to impose such restrictions. Finally, the latter of the two suggestions made by NECNP has been mooted (see p. 167, *supra*), while the noise problem referred to in the former will be given full consideration in any event (see pp. 169-170, *supra*).

B. *Allegedly Unsupported Factual Findings.* Several of NECNP's exceptions (numbers 12, 14 and 15) reflect claims that certain factual findings made by the Licensing Board are unsupported by the record. From the manner of presentation of the argument in support of those exceptions (Brief, p. 23 and par. 1 and 3 on p. 24), we gather that those

exceptions relate to factual findings which are not viewed as crucial to the ultimate result reached in the case. We discuss those exceptions briefly.[37]

1. In discussing the environmental impact of the cooling towers, the Licensing Board mentioned its concern with "the inclusion of chemicals associated with river water, such as cadmium [and] mercury . . . , that may be carried off site" (Initial Decision at 16, RAI-73-2 at 134-35). This concern was alleviated, however, by the evidence that there was "no drift of water droplets off site and thus no transport of chemically laden particles" in tests made at 50% of full power (Initial Decision at 16, RAI-73-2 at 135).

In discussing its concern over possible effects from these chemicals, the Board found that "there is no evidence of significant concentrations of those chemicals in the river water" *(ibid.)*. Citing comments filed by the Environmental Protection Agency in response to the draft environmental statement, NECNP excepts to this finding.

EPA's letter did state that "there exist unusually high levels of cadmium and mercury in the Connecticut River" (FES, p. A-75).[38] Thus, NECNP's exception is well taken, at least to the extent that the EPA letter — which was admitted into evidence as part of the FES — establishes the literal incorrectness of the finding that there was "no" evidence of significant concentrations of the two metals. There

[37] NRDC's exception 19 deals with a statement the Board made with respect to its acceptance of the applicant's proposed findings. That exception is denied as lacking in either materiality or specificity, depending upon its purpose.

[38] EPA's concern was not with off-site drift as such. Rather, EPA feared that, as a result of evaporative losses occasioned by cooling tower operation, the concentration of these metals would increase, that is, that there would be even higher concentrations in the cooling tower blowdown than were present in the original river water. This, in turn, could lead to a higher accumulation of these metals in the tissue of fish and other aquatic biota. See FES, pp. A-75–A-76.

was, however, evidence adduced which countered EPA's unparticularized assertion and demonstrated, based on actual monitoring, that the levels of these metals in the Connecticut River are quite low. See FES, p. II-18; Ex. 1 to written Testimony of George Starbuck, following Tr. 5229. That evidence is far more persuasive than EPA's unsupported conclusory assertion.[39]

In any event, NECNP does not urge that we add any conditions to the license to insure that no injury results from the presence of these metals in the cooling tower blowdown. In light of the applicant's commitment to monitor and, if necessary, treat that blowdown, we find it unnecessary to take further action.

2. The temporary operating license issued on September 7, 1972, did not expire until February 28, 1973. Because the hearing was closed on November 9, 1972, NECNP takes exception to the Board's statement in its initial decision, issued virtually contemporaneously with the expiration of the temporary operating license, that there "has not been any injury" to the public in the course of "the operations undertaken pursuant to the temporary operating license" (Initial Decision at 4-5, RAI-73-2 at 131).

It is not clear to us that the Board's statement was intended to cover the period after the hearing closed. If it was, we would agree with NECNP that it was overbroad and unsupported by the record. In addition, it would have

[39] While the evidence referred to rebuts EPA's assertion, the discussion in the FES of EPA's comment was non-responsive. FES, pp. XII-1–XII-2. Thus, that portion of the FES does not discuss the Connecticut River but instead states only that "the concentrations of cadmium and mercury *in waters of rivers in the U.S.* are extremely low" [emphasis added]; even then, it goes on to concede that very low concentrations of mercury and cadmium in water "can produce toxic effects on aquatic organisms," and thus does little to alleviate the concerns expressed by EPA (see fn. 38, *supra*).

been gratuitous for, as NECNP points out (Brief, p. 23), "there was no attempt to explore this issue" in the hearing. For precisely these reasons, we have not given any weight to this statement of the Board in reaching our decision. Any error that might have been committed is, therefore, harmless.

3. NECNP asserts that there was no record basis for the Board's finding that "the present shutdown", which took place after the record was closed, "was undertaken out of an abundance of caution on an emergency basis to examine and determine the extent of the effect" from fuel rod hydriding (Initial Decision at 11, RAI-73-2 at 133). Again, NECNP's exception is technically well-taken. But the exception ignores that NECNP itself had urged at oral argument before the Licensing Board that the shutdown constituted the "first refueling outage" at which the applicant was committed to install the advanced off-gas system (Oral Argument Tr. 163). We view the Board's finding as nothing more than a response to that argument, premised on an analysis of the situation as counsel had represented it to exist. In any event, the point is now moot (see p. 167, *supra*).

C. *Continued Service of Documents.* The Licensing Board refused NECNP's request that it require the continuation, during the full term of the license, of the practice, followed during the hearing, of serving all applicant-staff correspondence relating to the facility upon the parties and the Brattleboro public document room. NECNP's challenge to that ruling (exception 16) is met by the applicant's argument (apparently endorsed by the staff) that no rule or regulation requires such service to be continued.

We believe that the questions of continued service upon the parties and continued maintenance of the document room are governed by different considerations. The parties' entitlement to personal service derives from their participation in an ongoing administrative proceeding. That right is different in nature from the right, if any, of the public generally to access to relevant documents in the vicinity of the plant.

With respect to service upon the parties, our decision is controlled by our view that a contested licensing proceeding cannot be said to be fully completed until judicial review has been concluded (or the time for seeking such review expires without review having been sought). Moreover, during the course of judicial review, the parties have the right to request the court to remand the case to the Commission for the consideration of new evidence. 28 U.S.C. 2347(c). Although such a request may well be less freely granted than a request to reopen a hearing prior to issuance of an initial decision (see ALAB-138, *supra,* RAI-73-7 at 523), the two rights are analogous insofar as their effective exercise, in circumstances where time is of the essence, requires ready and rapid access to new information. For these reasons, we hold that the practices with respect to service of documents upon parties followed during the course of the administrative proceedings must continue unabated during the period allowed for seeking judicial review; thereafter, during the pendency of judicial review, those practices must continue unabated with respect to those parties who participate in the judicial review proceedings.[40]

While the service of documents upon the parties must, therefore, be continued for a time, we have concluded that

[40] Nothing we say here, of course, is intended to preclude some or all of the parties from entering into voluntary arrangements to continue serving documents after judicial review has been concluded. And, the issue not having been presented here, we express no opinion as to whether a party is entitled, after judicial review has been concluded, to personal service of those documents which relate to a continuing reporting or monitoring requirement imposed in connection with the resolution of an issue as to which the party had played an active role in the hearing.

there need not be continued maintenance of a document room in the locality of the plant. No statutory or regulatory provision expressly requires the maintenance of such a room; indeed, since the Commission has by regulation provided for a general public document room in Washington, D. C. (10 CFR 2.790, 9.7),[41] it is fair to draw the negative inference that the Commission presently intends that no other document room need be maintained.

NECNP argues, however, that the existence of a local document room is necessary to preserve and make effective the public's right "to utilize the procedures for suspension or revocation of a license under 10 CFR Part 2, Subpart B" (Brief, p. 25). This argument has some force. Thus, although it is unstated in the regulations, the practice in recent times has been to afford the public a right to utilize those procedures by requesting the Commission or the Director of Regulation to initiate proceedings, by the issuance of a "show cause" order, to modify, suspend or revoke a license. 10 CFR 2.202.

We can also agree with NECNP's theory that statutes or regulations conferring substantive rights can be read as conferring also those procedural rights necessary to an exercise of the substantive right. See, *e.g.*, *Steele* v. *Louisville & Nashville RR Co.*, 323 U.S. 192, 204 (1944). Where we part company with NECNP is on the proposition that the existence of a local public document room is a procedural right necessary to the exercise of the right to call for the initiation of a "show cause" proceeding. There are alternative methods by which the public can obtain information. These methods include the use of the Washington, D. C. Public Document Room and the exercise of the rights conferred by the Freedom of Information Act. See 10 CFR

[41] Document rooms serving limited purposes are maintained at certain major operating field offices. 10 CFR 9.7, 1.3(b).

9.8. In the absence of the time constraints which exist during the course of the basic licensing proceeding, these alternative methods are adequate to permit effectuation of the right to call for a "show cause" proceeding.

In short, there is no "necessity," in the legal sense, for the continued maintenance of a local document room.[42] But there certainly is a substantial degree of administrative burden attached to maintaining such a room. In this connection, the requirement NECNP would have us impose would be applicable to all reactor facilities, since NECNP's argument does not rely upon any special circumstances associated with this facility. For these reasons, and because the Commission has provided by rule for the Washington, D. C. document room, we believe that the question as to whether local document rooms should be maintained during the life of a facility license is one that can be addressed only by the Commission in the exercise of its rulemaking authority and not by this Board in the exercise of its adjudicatory functions.

D. *An "Unresolved" Matter.* In a footnote to its opinion, the Licensing Board observed that during the proceeding below it had raised a question concerning the staff's recommendation that during operations the containment atmosphere be inerted by the use of nitrogen (Init. Dec. p. 12, fn. 3, RAI-73-2 at 133). As the Board related it, the applicant had objected to this recommendation but had not called for resolution of the dispute in the hearing. According to the Board, the staff had failed to furnish data which the Board

[42] In our opinion, no such necessity may be inferred from the fact that a local public document room is maintained during the course of a proceeding. Even if — and we do not intend to intimate a view on this question — such a room were deemed "necessary" to the effective exercise of certain rights at the hearing stage (*e.g.*, the right to petition for leave to intervene in the hearing), that would not be determinative as to whether it is necessary to the exercise of rights existing at a later stage.

had requested on this point. Having said that, the Board terminated its discussion by noting that the question remained "unresolved" *(ibid.)*.

We have been supplied with no record references which would have enabled us to ascertain the precise nature of the Board's expressed concern. We note, however, the concern of the Advisory Committee on Reactor Safeguards (ACRS) that a consequence of inerting may be to make more difficult "inspection and repair of the primary system".[43] As we understand it, inerting has the intended purpose of mitigating the potential consequences of a very unlikely accident. In achieving that purpose, it can have the adverse consequences of hampering thorough inspection and repair activities (thereby threatening to increase the possibility of the accident whose consequences are intended to be mitigated) and posing a health and safety threat to one segment of the public, *i.e.*, plant workers.[44]

The question raised by the Board should not have remained unresolved. As we noted in an earlier opinion, this operating licensing proceeding is governed by the former version of the Rules of Practice, whereby issues other than those raised by the parties may be considered by the adjudicatory tribunals (ALAB-124, *supra*, RAI-73-5 at 362, fn. 4). The issue raised by the Board is a significant one which has been the subject of discussion for some time.

In view of the lengthy period during which this proceeding has been before us, we are reluctant to defer any longer our complete resolution of all the issues presented. Yet the issue of the advisability of inerting is not susceptible of resolution on the existing record (which to our knowledge

[43] See p. 3 of the March 9, 1971 ACRS "Report on Vermont Yankee Nuclear Power Station."

[44] See, in the latter respect, *Iowa Electric Light and Power Co.* (Duane Arnold Energy Center), ALAB-134, RAI-73-7 483.

is silent on this issue) and we believe that to leave the issue unresolved would constitute an abdication of our responsibilities. For these reasons, we are directing that the following memoranda be submitted to us:

(A). If the applicant and staff have reached a mutually satisfactory resolution of this issue, a memorandum from the staff by Friday, March 8, 1974 (with replies, if any, from other parties by Wednesday, March 20, 1974), delineating (1) the substance of the solution; (2) the basis for the belief that the safety questions raised by the Licensing Board and the ACRS have been satisfactorily resolved; and (3) a suggested approach for submitting the matter to this Board for resolution on the record.

(B). If the applicant and staff have not reached a mutually satisfactory resolution of this issue, a memorandum from each of these parties by Friday, March 8, 1974 (with replies from them and any other interested parties by Wednesday, March 20, 1974) delineating (1) the substance of each party's position on the issue; (2) the basis for the belief by each that adoption of its position would constitute a satisfactory resolution of the safety questions presented; and (3) a suggested approach for resolving the issue on the record.

VI

CONCLUSION

For the reasons stated, the exceptions are *denied* except insofar as granted in part herein.[45] The parties shall continue to serve documents in accordance with the requirements set forth herein. Condition A to the license is to be rewritten to read as follows:

Applicant shall operate the facility only under the closed cycle mode of cooling until, in the opinion of the advisory group for non-radiological monitoring (estab-

[45] Even though certain exceptions have been granted in part, the effect of that action has not been to disturb the existing operating license authorization.

lished by Section 2.2.2 of the Technical Specifications, as amended), (1) sufficient data have been obtained to establish an environmental base-line so that changes produced by other modes of cooling can be properly evaluated, and (2) in light of such data, there is reasonable assurance that testing of other cooling methods will not itself result in significant adverse effects on the environment. Thereafter, with the approval of the AEC Regulatory Staff, operations utilizing other modes of cooling for testing purposes may be undertaken. Upon completion of the tests, the advisory group shall make recommendations to the staff concerning the permanent restrictions, if any, which should be placed upon operations under other than the closed cycle mode of cooling.

In accordance with our established practice, we have examined those portions of the initial decision to which no exceptions were taken. With the possible exception of the question of inerting, our examination does not disclose any error on the Board's part which would affect the validity of its conclusion that the authorization of the issuance of an operating license was merited by the evidence.

Accordingly, subject to the outcome of the presently-unresolved question of inerting, and except insofar as modified herein, the initial decision is *affirmed.*

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

MARGARET E. DUFLO
Secretary to the Appeal Panel

ATOMIC ENERGRY COMMISSION
[10 CFR Part 50]

ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE

Notice of Proposed Rule Making

Notice is hereby given that the Atomic Energy Commission is considering possible amendments to its regulations in 10 CFR Part 50, Appendix D, "Interim Statement of General Policy and Procedure: Implementation of the National Environmental Policy Act of 1969 (Public Law 91-190)," that would specifically deal with the question of consideration of environmental effects associated with the uranium fuel cycle in the individual cost-benefit analyses for light water cooled nuclear power reactors.

The Commission's regulation implementing the National Environmental Policy Act of 1969 (NEPA) in 10 CFR Part 50, Appendix D, requires that each draft and final detailed statement prepared pursuant to section 102(2) (C) of NEPA for a nuclear power reactor contain a cost-benefit analysis which, among other things, considers and balances the adverse environmental effects and environmental, economic, technical, and other benefits of the facility. This regulation further provides that the cost-benefit analysis will, to the fullest extent practicable, quantify the various factors considered.

In several nuclear power reactor licensing proceedings it has been argued that the cost-benefit analysis for the facility that is the subject of the licensing action should include costs and benefits associated with the uranium fuel cycle, such as environmental effects of reprocessing spent fuel and disposal of wastes resulting from reprocessing. Other

factors related to the fuel cycle include those associated with uranium mining and milling, uranium hexafluoride production, isotopic enrichment, fuel fabrication, and transportation associated with the above. It has been urged that in each power reactor case the contribution of the nuclear power reactor to the environmental costs associated with the fuel cycle activity should be ascertained and considered in the cost-benefit balance.

The Commission's Atomic Safety and Licensing Appeal Board has held that environmental impact statements for nuclear power reactors should consider, among other things, environmental effects of the transportation of irradiated nuclear fuel from the facility that is the subject of the licensing action, and the transportation of low level wastes and of high level solid wastes other than irradiated fuel from the facility to depositories, but should not consider environmental effects of reprocessing of irradiated nuclear fuel, the disposal of wastes resulting from reprocessing, or disposal of low and high level solid wastes. In the matter of Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), Docket No. 50-271, Memorandum and Order, June 6, 1972. Subsequently, the Appeal Board in that case held that mining and manufacturing of reactor fuel are not within the scope of the environmental review prescribed for nuclear power reactors by NEPA and the Commission's regulations (Decision, October 11, 1972).

In connection with the foregoing, it should be noted that in conjunction with the revision of Appendix D of 10 CFR Part 50 on September 9, 1971, there was transmitted by the Director of Regulation to applicants for licenses to construct or operate nuclear power plants, and made available to the public, a document dated September 1, 1971, which, among other things, indicated that applicants' environmental reports should describe the environmental effects of

the transportation of fuel elements from the fuel fabrication plant to the reactor as well as the transportation of spent fuel elements from the reactor to the fuel reprocessing plant and the transportation of packaged radioactive material from the reactor to low level waste burial grounds.

There are in the United States well over 100 nuclear power reactors in operation, under construction, or on order, and, in addition, three commercial nuclear fuel reprocessing facilities have received operating licenses or are under construction. The existence of a uranium mine or mill, uranium hexafluoride plant, enrichment facility, fuel fabrication plant, fuel reprocessing plant, or ultimate waste depository does not depend upon the licensing of any one nuclear power reactor, nor does the cold or irradiated fuel or waste from any one reactor make more than a fractional contribution, if any, to the effects of such activities or facilities. Uranium mining and milling, uranium hexafluoride production, isotopic enrichment, and fuel fabrication will contribute fuel to many nuclear reactors and the effects associated with fuel reprocessing and waste disposal will be those associated not only with nuclear power reactors now operating or under construction, but also with those that are no longer in operation and those that are planned for the future. There does not appear to be any way to ascertain with any degree of certainty which of the uranium mines or mills, uranium hexafluoride plants, isotopic enrichment facilities, and fuel fabrication plants in existence or to be operated in the future will contribute fuel to a given nuclear power reactor, or which of the various fuel reprocessing plants or commercial burial grounds now in existence or to be constructed from time to time will receive irradiated fuel or wastes from any given nuclear power reactor.

Many of the various elements in the nuclear fuel cycle involve varying methods or processes with different en-

vironmental and other effects and there is no reason to believe that during the useful life of any given nuclear power reactor other methods or processes with different effects will not be developed. In addition, effects of uranium milling and mining, uranium hexafluoride production, fuel element fabrication, spent fuel reprocessing, operation of licensed burial grounds, and transportation incident to each of the above, are, except as those activities are subject to agreement State jurisdiction, the subject of Commission NEPA review proceedings associated with issuance of materials or facility licenses that are separate from the review proceedings for issuance of licenses for nuclear power reactors.

Cost-benefit analyses of nuclear power reactor license applications should contain a full and frank disclosure and consideration of costs and benefits of the proposed action. The results of the application of this principle to the question of inclusion of environmental effects associated with the fuel cycle are not entirely clear. As the above discussion indicates, the fractional contribution, if any, of the environmental effects of the fuel cycle to the cost-benefit balance for a particular nuclear reactor is difficult, and may be impossible, to ascertain with any degree of certainty. This suggests that such matters, if they are to be considered at all, be considered in a generic fashion through the rule making process. The Commission's regulatory staff has prepared a report entitled "Environmental Survey of the Nuclear Fuel Cycle," dated November 6, 1972, which provides a basis for an informed consideration of the generic question of the environmental impact associated with the uranium fuel cycle in light water cooled nuclear power reactor licensing proceedings.

To aid the Commission in its consideration of possible amendments to Appendix D to 10 CFR Part 50 of its regu-

lations that would deal with the question of the account to be taken of the enviromental effects associated with the uranium fuel cycle in individual cost-benefit analyses for light water-cooled nuclear power reactors, interested persons are invited to submit comments and suggestions, together with relevant data and information, with respect to possible additions to 10 CFR Part 50 along the following alternative lines:

(1) In the case of light water-cooled nuclear power reactors, the applicant's environmental report and the Commission's detailed statement shall contain a full discussion of, inter alia, the environmental effects of the transportation of cold fuel to the reactor and irradiated fuel from the reactor to a fuel reprocessing plant and the transportation of low level waste and high level solid wastes (other than irradiated fuel) from the reactor to depositories. Those documents need not cover the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, disposal of low level and high level solid wastes or transportation related to such activities (other than transportation of cold fuel to, and irradiated fuel from, the reactor), since the environmental effects of those activities as related to a particular light water-cooled nuclear power reactor have been analyzed in the Commission's "Environmental Survey of the Nuclear Fuel Cycle" and, when factored into the cost-benefit analysis, are sufficiently small as not to affect significantly the resultant conclusion. The environmental effects of the latter activities will generally be considered in detail in proceedings in which approval for such activities, or closely related activities, is sought.

(2) Or in the case of light water-cooled nuclear power reactors, the applicant's environmental report and the

Commission's detailed statement shall contain a full discussion of, inter alia, the environmental effects of the transportation of cold fuel to the reactor and irradiated fuel from the reactor to a fuel reprocessing plant and the transportation of low level wastes and high level solid wastes (other than irradiated fuel) from the reactor to depositories. In such documents, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation and disposal of wastes resulting from such reprocessing, disposal of low level and high level solid wastes and transportation related to such activities (other than transportation of cold fuel to, and irradiated fuel from, the reactor) to the environmental costs of licensing the nuclear power reactor, shall be as set forth in the following Table S-3 of the Commission's "Environmental Survey of the Nuclear Fuel Cycle":[1]

[1] The "Environmental Survey of the Nuclear Fuel Cycle" provides the supporting data for this summary table.

TABLE S-3

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR NUCLEAR FUEL CYCLE
(NORMALIZED TO MODEL LWR ANNUAL FUEL REQUIREMENTS)

Natural resource use	Total	Effluents — Chemical (MT)	Total
Land (acres):		Gases (including entrainment):[1]	
Temporarily committed	63	SO_x	4400
Undisturbed area	45	NO_x[2]	1170
Disturbed area	18	Hydrocarbons	11.3
Permanently committed	4.6	CO	28.7
		Particulates	1156
Overburden moved (MT×10⁻⁶)	2.7	Other gases:	
Water (gallons×10⁻⁶):		F–	1.0
Discharged to air	163	Liquids:	
Discharged to water bodies	11,052	$SO_4^=$	5.8
Discharged to ground	123	NO_3^-	8.2
Total	11,338	Fluoride	0.4
		Ca^+	5.4
Fossil fuel:		Cl^-	8.2
Electrical energy (mw.-hr.×10⁻⁶)	317	Na	13.5
Equivalent coal (MT×10⁻⁶)	116	NH_3	8.4
Natural gas (s.c.f.×10⁻⁶)	103	Fe	0.4
		Tailings solutions (×10⁻⁶)	240
		Solids	91,000

Effluents—Radiological (curies)	Total	Maximum effect per annual fuel requirement of model 1000 MWe LWR
Gases (including entrainment):		
Rn-222	83	Principally from mills — Maximum annual dose rate <4 percent of average natural background within 5 miles of mill. Results in 0.06 man-rem per annual fuel requirement. Due to dilute concentration and short half-life of principal component, exposure beyond a 5-mile radius is minuscule relative to natural background.
Ra-226	.02	
Th-230	.02	
Uranium	.046	
Tritium (×10⁻⁶)	12	
Kr-85 (×10⁻⁶)	350	
I-129	.002	
I-131	.02	Principally from fuel reprocessing plants—Whole body dose is 4.4 man-rem for population within 50-mile radius. This is <0.005 percent of average natural background dose to this population.
Fission products	1.0	
Transuranics	.004	
Liquids:		
Uranium and daughters	2.4	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.027	From UF_6 production—concentration <5 percent of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	.27	
Th-234	.001	From fuel fabrication plants—concentration <1 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Other uranium daughters	.001	
Ru-106	4	From reprocessing plants—maximum concentration <4 percent of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (×10⁻⁶)	6.2	
Solids (buried):		
Other than high level	1,200	From mills—included in tailings returned to ground—no significant effluent to the environment.
Thermal (B.t.u. ×10⁻⁶)	3,370	

[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.2 percent from natural gas use and process.

The Commission will hold an informal rule-making hearing on possible amendments described in (1) and (2) above on February 1, 1973, at 10 a.m. The location and the presiding officer will be designated in a notice that will be published in the FEDERAL REGISTER in the near future.

Interested persons are invited to attend the hearing and present oral or written statements. Any person who intends to present views at this hearing should furnish in writing his name and the name of the organization he represents to the Secretary of the Commission by January 1, 1973. The hearing will be conducted as a legislative-type hearing. Since the hearing will be part of a rule making, rather than an adjudicatory, proceeding, the provisions of Subpart G, "Rules of General Applicability," of 10 CFR Part 2, the Commission rules of practice, will not be applicable.

Nothing herein shall be construed as affecting the continuing validity of the above-described holdings by the Appeal Board in the Vermont Yankee proceeding during the course of this rule making proceeding, and they shall continue in effect unless and until modified by promulgation of a regulation or other Commission action.

All interested persons who desire to submit written comments or suggestions in connection with the possible amendments to Appendix D of 10 CFR Part 50 or the "Environmental Survey of the Nuclear Fuel Cycle," should send them to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Staff, within sixty (60) days after publication of this notice in the FEDERAL REGISTER.

Copies of comments on this notice as well as the "Environmental Survey of the Nuclear Fuel Cycle," dated November 6, 1972, may be examined at the Commission's Public Document Room at 1717 H Street NW., Washington, DC 20545. In addition, copies of the environmental survey may be obtained upon request addressed to the Deputy Director for Fuels and Materials, Directorate of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545.

(Sec. 161, 68 Stat. 948; sec. 102, 83 Stat. 853, 42 U.S.C. 2201, 4332)

Dated at Germantown, Md., this 10th day of November 1972.

For the Atomic Energy Commission.

PAUL C. BENDER,
Secretary of the Commission.

[FR Doc. 72-19698 Filed 11-14-72; 8:53 am]

ATOMIC ENERGY COMMISSION

[10 CFR Part 50]

[Docket RM-50-3]

ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE

Notice of Hearing

On November 15, 1972, the Atomic Energy Commission published in the FEDERAL REGISTER (37 F.R. 24191) a notice of proposed rule making concerning possible amendments to CFR Part 50, appendix D, that would deal specifically with the environmental effects associated with the uranium fuel cycle in the individual cost-benefit analyses for light water-cooled power reactors. The notice scheduled an informal rule making hearing on the possible amendments on February 1, 1973, at 10 a.m.

The location of the hearing will be New Executive Office Building, Room G-2008, 17th and H Streets NW., Washington, D.C.

A hearing board consisting of Max D. Paglin, Esq.—Chairman, Dr. Martin J. Steindler and Dr. John C. Geyer will preside.

As stated in the November 15, 1972, notice, the hearing will be part of a rule making, rather than an adjudicatory, proceeding and the provisions of Subpart G, "Rules of General Applicability," of 10 CFR Part 2, the Commission's rules of practice, will not be applicable.

The procedural format for the hearing will follow the legislative pattern, and no discovery or cross-examination will be utilized. It should be noted, however, that the report prepared by the Commission's regulatory staff, entitled 'Environmental Survey of the Nuclear Fuel Cycle," dated November 1972, which provides a basis for an informed

consideration of the generic question of the environmental impact associated with the uranium fuel cycle in light water-cooled nuclear power reactor licensing proceedings, is available to members of the public at the Commission's public document room at 1717 H Street NW., Washington, D.C. 20545. In addition, that report contains extensive references to background documents available to members of the public at the Commission's public document room.

The hearing will be conducted as informally and as expeditiously as practicable, consistent with affording the participants a reasonable opportunity to present their positions. Those participating in the hearing may, but need not be, represented by counsel.

Relevant written statements may be received for the record and those participating may, depending upon the number of requests received and the time available, be permitted to make brief oral statements of their views either in addition to, or in lieu of, written submissions. Persons making oral statements will not be sworn. Such persons, however, as well as persons offering written submissions at the hearing, will be subject to questioning by the presiding hearing board. All written comments and suggestions received pursuant to the invitation therefor set forth in the November 15, 1972, notice will be incorporated in the record of the proceeding.

The hearing board is authorized to take all necessary and appropriate action to control the course of the hearing, including, among other things, the holding of one or more procedural planning sessions. A transcript of the hearing will be made, and a copy of the transcript, together with copies of all documents presented at the hearing, will be placed in the Commission's public document room, 1717 H Street NW., Washington, D.C., where they will be available for inspection by members of the public.

At the conclusion of the hearing the record will be held open for a period of 30 days during which time any person may file such supplementary written statements as may be deemed appropriate in light of the hearing record. After the 30-day period expires, the presiding hearing board, without rendering any decision or making any recommendation, will forward the transcript of the hearing to the Commission together with an identification of issues raised at the hearing. The Commission will carefully consider the transcript of the hearing and the comments and suggestions submitted pursuant to the November 15, 1972, notice as well as other relevant considerations and factors, and, after reaching its determination in the rule making proceeding, will cause an appropriate notice to be published in the FEDERAL REGISTER.

(Sec. 161, 68 Stat. 948; sec. 102, 83 Stat. 853; 42 U.S.C. 2201, 4332)

Dated at Washington, D.C., this 27th day of December 1972.

For the Atomic Energy Commission.

PAUL C. BENDER,
Secretary of the Commission.

[FR Doc. 73-123 Filed 1-2-73; 8:45 am]

Title 10 — Energy

CHAPTER I — ATOMIC ENERGY COMMISSION
PART 50 — LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

Environmental Effects of the Uranium Fuel Cycle

On November 15, 1972, the Atomic Energy Commission published in the FEDERAL REGISTER a notice of consideration of possible amendments to Appendix D, Interim Statement of General Policy and Procedure: Implementation of the National Environmental Policy Act, 10 CFR Part 50, Licensing of Production and Utilization Facilities (37 FR 24191). The amendments proposed here supplement our established rules for fulfilling section 102(2)(C) procedures of NEPA. The amendments address the question whether to consider the environmental effects associated with the uranium fuel cycle in the individual cost-benefit analyses for light-water-cooled nuclear power reactors. The Atomic Safety and Licensing Appeal Board had earlier held that some such effects should be considered while others should not.[1]

The proposed amendments set forth two alternative approaches to considering the environmental effects associated with the uranium fuel cycle. Under the first, such environmental effects would not have to be considered in applicants' environmental reports and Commission detailed statements of environmental considerations since, if factored into individual cost-benefit analyses, they would be sufficiently small as not to affect significantly the resultant conclusion. Under the second alternative, the environmental effect as-

[1] Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-56, ALAB-73 (June 6, 1972 and October 11, 1972).

sociated with the uranium fuel cycle, albeit small, would be factored into individual cost-benefit analyses in the form of numerical values derived from the instant proceeding. The second alternative has been adopted by the Commission as an effective rule, with certain clarifying and editorial changes. Insofar as this rule differs from the Appeal Board decisions in "Vermont Yankee" supra, those decisions have no further precedential significance. The Commission also notes that adoption of this amendment is without prejudice to consideration of whether or not a full generic environmental impact statement on the uranium fuel cycle should be issued pursuant to 10 CFR Parts 11 and 51 of the Commission's regulations.

The FEDERAL REGISTER notice announced the availability for comment of the "Environmental Survey of the Nuclear Fuel Cycle," dated November 1972, prepared by the Commission's Regulatory staff. This document was designed to serve as a primary data base for the proposed amendment and not as an analysis of alternatives and costs and benefits of the entire uranium fuel cycle. Indeed, certain portions of that overall fuel cycle are undergoing separate examination and are not involved in this proceeding. These include: (i) An environmental statement in support of a recommendation by the General Manager to continue the present program for developing Federal repositories for commercial high level wastes (38 FR 29350), and (ii) a separate rule making proceeding examining transportation of UO_2 fuel to and from light water reactors and transportation of solid wastes from such reactors to waste burial grounds (38 FR 3334).

In addition, another fuel cycle for light water reactors is under study by the staff. Typical programs underway on this subject include: (i) Preparation of a generic environmental impact statement concerning potential programs for

recycling plutonium in commercial light-water reactors (39 FR 5536), (ii) analysis of methods for disposal of wastes contaminated with plutonium, and (iii) an environmental analysis of the proposed amendment to 10 CFR 71 that would require significant quantities of plutonium to be shipped as a solid in packages providing at least double containment (38 FR 20482).

The survey described stages of the fuel cycle for the purpose of determining whether the cost-benefit analysis required by NEPA and our regulation (10 CFR Part 50, Appendix D) for environmental impact studies in licensing proceedings should include numbers quantifying effects of the uranium fuel cycle. The purpose of this proceeding was to make determinations as to whether certain elements should be factored into impact statements to be utilized in other proceedings; the purpose was not to undertake a full environmental review of the uranium fuel cycle. In short, this proceeding addresses a procedural question involving the implementation of NEPA's requirement for cost-benefit analyses in impact studies. For this reason, no environmental impact statement has been prepared in connection with the rule adopted today.

All interested persons were invited to submit written comments and suggestions in connection with the proposed amendments and the Environmental Survey within 60 days after publication of the notice in the FEDERAL REGISTER. In addition, an informal rule making hearing was held on February 1, 1973, to permit the presentation of written and oral views on the Environmental Survey and the alternative approaches to consideration of the environmental effects associated with the uranium fuel cycle.

On January 3, 1973, the Commission issued a Supplemental Notice setting forth the procedures which were to

be followed in the informal rule making hearing (38 FR 50). The notice stated, among other things, that since the hearing would be part of a rule making rather than an adjudicatory proceeding, the provisions of Subpart G, Rules of General Applicability, of Part 2 of the Commission's rules of practice would not be applicable and that, therefore, such procedural features as discovery and cross-examination would not be utilized. The notice provided, however, that the participants in the hearing would be subject to questioning by the presiding hearing board. The notice further provided that at the conclusion of the hearing, the record was to be held open for a period of 30 days during which time any person could file supplementary written comments deemed appropriate in light of the hearing record. After the expiration of the 30-day period, the presiding hearing board, without rendering any decision or making any recommendation, was to forward the hearing transcript to the Commission together with an identification of issues raised at the hearing.

Written comments were received from 46 individuals and organizations representing Federal and State agencies, industry, public utilities, environmental and citizen groups, and private citizens. Participants in the informal rule making hearing included the Commission's Regulatory staff; the Environmental Protection Agency; the Mapleton Intervenors of Midland, Michigan; Westinghouse Electric Corporation; Consolidated National Intervenors and the Union of Concerned Scientists, jointly; the Atomic Industrial Forum; the Consolidated Utilities, composed of fourteen utilities appearing jointly; the New York State Department of Environmental Conservation; and the Minnesota Pollution Control Agency. In addition, two individual members of the public made limited appearances.

In its "Report to the Commission by the Nuclear Fuel Cycle Hearing Board," submitted on July 6, 1973, pursuant

to a Supplemental Notice of Hearing published on January 3, 1973, the presiding hearing board identified a number of issues which it believed were raised at the hearing and in the written comments. The first issue identified concerned a challenge by CNI/UCS to the procedures used by the Commission for the hearing. That participant argued that for any rulemaking hearing dealing with the environmental effects of the nuclear fuel cycle on a generic basis to be legally valid, the hearing must incorporate the same adjudicatory procedural features used in individual production and utilization facility licensing proceedings, including the rights of discovery and cross-examination. On the basis of this contention, the participant recommended adoption of a "third alternative" which would provide for an "on-going generic hearing" requiring preparation and circulation of an environmental impact statement. Under this alternative, parties to individual reactor licensing proceedings would be permitted to participate in an "adjudicatory" rule making proceeding, the findings of which would be incorporated into the record of individual licensing hearings.

The Commission has considered this challenge to the legal validity of the present rule making proceeding and the arguments in opposition which were filed by other parties. In our view, the procedures adopted provide a more than adequate basis for formulation of the rule we adopted. All parties were fully heard. Nothing offered was excluded. The record does not indicate that any evidentiary material would have been received under different procedures. Nor did the proponent of the strict "adjudicatory" approach make an offer of proof — or even remotely suggest — what substantive matters it would develop under different procedures. In addition, we note that all documents including the Survey were available to the parties several weeks be-

fore the hearing, and the Regulatory staff, though not requested to do so, made available various drafts and handwritten notes.[2] Under all of the circumstances, we conclude that adjudicatory type procedures were not warranted here.

The second area in which issues were identified by the presiding hearing board related to the scope and depth of the underlying Environmental Survey. One issue was whether, in light of the comments in the record, substantial revision of the survey should be made prior to adoption of a final rule. Also identified was the issue of whether the Administrative Procedure Act requires reopening of the proceeding to permit comment on any revised survey and whether such reopened proceeding should be made a proceeding conducted in the manner of the original proceeding in which comment would be invited on all aspects of the nuclear fuel cycle; or whether such proceeding should be limited to comment only on the revisions to the Survey.

In discussing the issues in this area, the presiding hearing board mentioned, among other things, the factors of safeguards against sabotage and diversion of nuclear materials and plutonium handling. The board also indicated that arguments had been advanced that the Survey was unreliable with respect to high level waste disposal in that facilities for such disposal are presently non-existent.

Sabotage and diversion receive considerable attention in licensing of individual fuel cycle facilities. The issuance of any special nuclear material license involving significant quantities of such material is contingent upon a finding by the AEC that the required accountability and physical se-

[2] Some or all of these items might not have been provided under rigid adjudicatory rules. For example, on the one occasion when CNI/UCS requested a specific document, it was promptly made available, even though it was an internal staff memorandum written for the Commissioners themselves.

curity systems are adequate to provide reasonable protection against acts of sabotage and diversion of materials. Beyond this, insofar as environmental impact is concerned, sabotage and diversion may be viewed in the context of possible contributing factors, among others, to accident conditions. The Environmental Survey does, in fact, consider a number of postulated accidents and their environmental effects. The postulated accidents thus considered in the Survey are deemed to be a reasonable representation of the environmental effects that could result from the more credible acts of sabotage.

Those aspects of the uranium fuel cycle which involve plutonium handling, namely recovery and storage, were described in the Environmental Survey. However, other forms of plutonium handling were not discussed in the survey because the survey is applicable only to light-water-power reactors using conventional uranium dioxide fuel. Reactors utilizing plutonium recycle fuel fall outside the Survey's scope of coverage and, therefore, the values in the Summary Table are inapplicable. As stated earlier, however, the Commission is presently drafting an environmental impact statement covering all aspects of the full-scale use of plutonium in light-water reactors, including the fuel cycle.

Considerable information was presented at the hearing on high level waste storage, utilizing a retrievable surface storage facility. A description was given of such facility, the normal radiological effluents, and a maximum credible accident. The estimated normal annual radiological release was 0.005 curies. Although the ultimate capacity of the facility would be about 80,000 canisters of waste, corresponding to about 8,000 annual fuel requirements (AFR), the initial capacity will be substantially less. Even if one assumed that the annual release from the facility were associated with a single annual fuel requirement, the fission

product release per annual fuel requirement would be 0.005 Ci/AFR. Since the release of solid fission products and actinides from the model reprocessing plant is estimated at 1.004 Ci/AFR, the omission of waste repository effluents from the original Environmental Survey did not materially affect the releases shown in the Summary Table. However, the 0.005 Ci/AFR value has been added to the 1.004 Ci/AFR value in the Summary Table for a combined total, when rounded off, of 1.01 Ci/AFR. While such a waste storage facility has not been constructed, preliminary conceptual designs have been developed using existing technology based on well established data and techniques.

The Commission believes that the Survey and hearing record provide an adequate data base for the regulation adopted. Revisions to the chemical effluents in Table S-3 have been made to reflect corrections or suggestions entered into the hearing record on UF_6 conversion facilities, UO_2 conversion plants and mining operations. Minor corrections with respect to radioactive effluents have been made and in no case do these corrections increase the effluent effects by more than .25 percent of natural background. To conform the table precisely to the text of the Survey, the values for iodine-129 and 131 releases have been changed from .002 and .02 curies to .0024 and .024 curies, respectively. In addition, values for exposure of workers and the general public in the transportation of radioactive materials covered in the Survey have been added to the Summary Table. To incorporate these changes, to incorporate data on the retrievable surface storage facility in high level wastes described in the hearing, and to add information suggested in comments received as a part of the hearing record, the Environmental Survey has been revised and is being issued in revised form concurrently with promulgation of this

amendment.[3] In view of the fact that these revisions are minor and reflect the record already developed, we see no occasion for reopening this proceeding.

A third area in which issues were identified by the presiding hearing board relates to the Environmental Survey's use of qualitatively styled and allegedly undefined descriptive phrases for its conclusions regarding the magnitude of the environmental impact. One issue is whether the Survey should be revised to define more precisely the magnitude and anticipated ranges of variables pertinent to an assessment of the environmental impact. The Summary Table, S-3, to be used as a basis for evaluating the environmental effects in a cost-benefit analysis for a reactor quantifies all releases, and relates maximum effects to recognizable standards where practical. The Commission believes that providing ranges of variables relevant to assessing environmental impact would serve little or no constructive purpose here since conservatism was utilized in deriving the Summary Table values, and thus, these values already reflect an environmental impact greater than that which is truly anticipated. In addition, developing a range of values would have required separate investigations of multiple factors at over 150 mines, some 19 mills, 2 conversion plants, 3 enrichment plants, and 10 fuel fabrication facilities — to arrive at a range of values augmenting numbers already reflecting substantial conservatism.

Another issue identified in this area is whether more extensive analyses of the long-term environmental effects of waste storage and disposal are necessary to sustain the validity of the conclusions in the Survey. The Commission

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[3] Among other things, the revised Survey refers to and gives excerpts from an analysis by the Environmental Protection Agency that show that the CNI/UCS analysis of the Nuclear Fuel Services operation does not accurately represent the most recent operating history of NFS.

believes that sufficient data were presented regarding engineered waste storage facilities to justify the conclusion that the contribution of waste storage and disposal to the total environmental impact of the fuel cycle is relatively insignificant. However, as more information on high level waste storage and disposal systems becomes available as a result of the environmental impact statement on high level waste storage referenced earlier, a more definitive assessment of the environmental impact can be undertaken and the Survey revised accordingly, as appropriate.

The third issue raised in this area is whether the averaging of environmental effects and the use of models for each fuel cycle step produced values sufficiently conservative to warrant the Survey's conclusion of negligible environmental impact. The "model" facilities defined for the Environmental Survey represent the true industry average for the UF_6 conversion, enrichment, and reprocessing portions of the fuel cycle. The model mill size chosen is near the upper range of mill sizes, and the major environmental effects from milling result from the airborne effluents and tailings waste disposal steps common to all mills. Choosing a relatively large mill as a basis tended to make local environmental effects large, and hence conservative. The fuel fabrication model plant is typical of two plants that produce about 60 percent of the fuel manufactured in the United States today and conservatively represents the remainder. The effluents from the model facility were estimated without taking credit for recently installed pollution-abatement equipment and the distance from the plant to the near site boundary of the model represents the smallest distance of any actual fuel fabrication plant. These model and effluent characteristics produce conservative estimates of environmental effects.

A fourth area in which the hearing board identified an issue relates to suggestions for revision and re-examination

of the Environmental Survey at periodic intervals. While the Commission agrees with the suggestions that the Survey be re-examined from time to time to appropriately accommodate new technology and information, it does not believe it necessary or advisable to impose any specific time limit. In our view, revision should be based on growth in the data base, not on any fixed and arbitrary time period. Should future revisions to the Survey necessitate changes in the Summary Table, further rule making will be undertaken and the public afforded an opportunity for comment.

A fifth issue identified by the hearing board is whether any provision should be made for exempting or limiting the applicability of a final rule insofar as pending licensing cases are concerned. In view of the fact that the environmental effects of the uranium fuel cycle have been shown to be relatively insignificant, the Commission believes that it is unnecessary to apply the amendment to applicant's environmental reports submitted prior to its effective date or to Final Environmental Statements for which Draft Environmental Statements have been circulated for comment prior to the effective date. However, Draft Environmental Statements prepared but not circulated for comment prior to the effective date will be revised in accordance with the provisions of the amendment.

The sixth issue identified is whether the Commission should re-examine the proposed "Alternatives" in light of the record of the proceeding to determine whether modifications are necessary or desirable. In reviewing the record of the rule making hearing the Commission finds general approval for its generic approach to the consideration to be given to the environmental effects associated with the uranium fuel cycle. Many participants advocated adoption of one alternative or the other, other participants proposed modified versions of the alternatives, and one participant

advocated adoption of a third alternative which was discussed earlier. After examining these proposals, and after re-examining its own proposed alternatives, the Commission has adopted a slightly modified version of Alternative 2. The Commission, as did many of the hearing participants and commentators, favors the approach of Alternative 2 over that of Alternative 1 because the former conforms with the requirements of subsections 3 and 8 of section A of Appendix D to 10 CFR Part 50 in that it quantifies, to the fullest extent practicable, the environmental effects of the uranium fuel cycle in individual cost-benefit analyses. Incorporation of the Summary Table values into cost-benefit analyses in environmental reports and detailed statements will also help to assure more complete and meaningful documents. The changes in the effective amendment are clarifying and editorial in nature.

The seventh issue identified is whether further clarification is necessary to make clear that the Environmental Survey and the Summary Table of values are purely descriptive and are not intended as operating limits which may be imposed in licensing and regulatory actions with respect to the various fuel cycle facilities. Neither the effective amendment nor the Environmental Survey state or imply that the values in the Summary Table are to be imposed as operating limits on present and future fuel cycle facilities. Such limits are established and governed by other AEC regulations, principally, the provisions of Part 20 of Title 10 of the Code of Federal Regulations, "Standards for Protection Against Radiation." Further clarification is considered unnecessary.

The presiding hearing board raised two additional items which it believed merited Commission attention. The first was more in the nature of a suggestion to the Commission that the Regulatory staff be directed to assure the ready

availability of the background references, reference materials, and various calculations which served as the basis for the conclusions in the Survey. Copies of all non-copyrighted material, together with prior drafts of the Environmental Statement marked up by the staff, and over 100 pages of handwritten calculations were given to the Public Document Room on January 5, 1973. Therefore, the Commission believes that the staff had already complied with this suggested directive by making these background references, uncopyrighted reference materials, previous drafts and the various calculations available in the AEC's Public Document Room.

The second item referred to is whether the Environmental Survey should have discussed alternative processes with regard to fuel cycle operations. The purpose of the Survey was to provide a data base from which numerical values could be derived which would reflect the environmental impact associated with the uranium fuel cycle. These values would then be factored into cost-benefit analyses for individual reactors under the alternative adopted. Whenever possible, Survey data were based on actual operating fuel cycle facilities in order to produce numerical values reflecting real or actual environmental impact. Where this was not possible, conservatism was utilized. As stated earlier, the Environmental Survey is not an impact statement, and therefore, a discussion of alternatives is not required. In addition, the Commission does not believe that the Survey is the appropriate place to discuss alternatives in view of the fact that alternatives are considered in the NEPA context in individual licensing actions on fuel cycle facilities. On the basis of the foregoing and consideration of the comments received, the record of the hearing and other factors involved, the Commission has adopted the amendment set forth below. The amendment is essentially identical to the

second alternative contained in the November 15, 1972 FEDERAL REGISTER notice (37 FR 24191), except for minor clarifying and editorial changes.

Pursuant to the Atomic Energy Act of 1954, as amended, and sections 552 and 553 of Title 5 of the United States Code, the following amendment to Appendix D to 10 CFR Part 50 is published as a document subject to codification.

1. A new subsection 15 is added to section A to read as follows:

15. (a) In applicant's environmental reports and the Commission's detailed statements for light-water-cooled nuclear power reactors, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low level wastes and high level wastes related to uranium fuel cycle activities to the environmental costs of licensing the nuclear power reactor, shall be as set forth in the following Table S-3 of the Commission's "Environmental Survey of the Uranium Fuel Cycle." No further discussion of such environmental effects shall be required.

(b) This section does not apply to any applicant's environmental report submitted pursuant to section 4 prior to June 6, 1974, or to any Final Environmental Statement for which a Draft Environmental Statement had been circulated for comment prior to June 6, 1974.

Effective date. The foregoing amendment is effective on June 6, 1974.

(Sec. 161, Pub. L. 83-703, 68 Stat. 948; Sec. 102 Pub. Law 91-190, 83 Stat. 853; (42 U.S.C. 2201, 4332)).

Dated at Washington, D.C. this 16th day of April 1974.

For the Atomic Energy Commission.

PAUL C. BENDER,
Secretary of the Commission.

TABLE S-3. — *Summary of environmental considerations for uranium fuel cycle*

[Normalized to model LWR annual fuel requirement]

Natural resource use	Total	Maximum effect per annual fuel requirement of model 1,000 MWe LWR
Land (acres):		
Temporarily committed	63	
Undisturbed area	45	
Disturbed area	18	Equivalent to 90 MWe coal-fired powerplant.
Permanently committed	4.6	
Overburden moved (millions of MT)	2.7	Equivalent to 90 MWe coal-fired powerplant.
Water (millions of gallons):		
Discharged to air	156	≈2 percent model 1,000 MWe LWR with cooling tower.
Discharged to water bodies	11,040	
Discharged to ground	123	
Total	11,319	<4 percent of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousands of MW-hour)	317	<5 percent of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT)	115	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	92	<0.2 percent of model 1,000 MWe energy output.
Effluents—chemical (MT):		
Gases (including entrainment):[1]		
SO_x	4,400	Equivalent to emissions from 45 MWe coal-fired plant for a year.
NO_x[2]	1,177	
Hydrocarbons	13.5	
CO	28.7	
Particulates	1,156	
Other gases:		
F-	.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards—below level that has effects on human health.
Liquids:		
SO_4=	10.3	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constitutents that require dilution and the flow of dilution water are: NH_3—600 cfs. NO_3—20 cfs. Fluoride—70 cfs.
NO_3-	26.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl-	8.6	
Na^+	16.9	
NH	11.5	
Fe	.4	
Tailings solutions (thousands of MT)	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—Radiological (curies):		
Gases (including entrainment):		
Rn-222	75	Principally from mills—maximum annual dose rate <4 percent of average natural background within 5 mi of mill. Results in 0.06 man-rem per annual fuel requirement.
Ra-226	.02	
Th-230	.02	
Uranium	.032	
Tritium (thousand)	16.7	Principally from fuel reprocessing plants—Whole body dose is 8 man-rem per annual fuel requirement for population within 50 mi radius. This is <0.005 percent of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/yr has been included in fission products and transuranics total.
Kr-85 (thousands)	350	
I-129	.0024	
I-131	.024	
Fission products and transuranics	1.01	
Liquids:		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production-concentration 5 percent of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Ru-106[3]	.15	From reprocessing plants—maximum concentration 4 percent of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (thousands)	2.5	
Solids (buried):		
Other than high level	601	All except 1 Ci comes from mills—included in tailings returned to ground—no significant effluent to the environment, 1 Ci from conversion and fuel fabrication is buried.
Thermal (billions)	3,360	<7 percent of model 1,000 MWe LWR.
Transportation (man-rem): Exposure of workers and general public	.334	

[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.2 percent from natural gas use and process.
[3] Cs-137 (0.075 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

(FR Doc. 74-9076 Filed 4-19-74; 8:45 am)

NUCLEAR REGULATORY COMMISSION

[Docket RM-50-3]

ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE

General Statement of Policy

Two recent decisions by the United States Court of Appeals for the District of Columbia Circuit raise significant questions regarding the future course of Commission licensing activities over the coming months. The decisions are *Natural Resources Defense Council, et al.* v. *NRC,* Nos. 74-1385 and 74-1586; and *Aeschliman, et al.* v. *NRC,* Nos. 73-1776 and 73-1867 (July 21, 1976). The purpose of this policy statement is to indicate how the Commission intends to conduct its licensing activities pending resolution of the several legal questions raised by the decisions. This statement is not intended to resolve, or indicate any resolution of, the question whether the particular licenses before the court in these cases are to be continued, modified, or suspended during the proceedings called for; since the court refused an explicit request to set aside these licenses, the Commission's view is that the court expects it to resolve this question in formal proceedings, in light of the facts and the applicable law. Nor is this statement intended to reflect any position the Commission may take in further litigation in these cases.

As this statement was in the final stages of preparation, the Commission received a proposal for rulemaking from the Natural Resources Defense Council concerning many of the issues discussed herein. Comments on that proposal are solicited in a coordinate *Federal Register* notice, also published today. Initial consideration of the petition indicates that it varies in several respects from this policy

statement. Some of these variations (notably, rules proposed for existing construction permits, LWA's and operating licenses) may reflect differing legal interpretations; however, in general, publication of the present policy statement will not irretrievably commit the Commission or others to a course inconsistent with the proposals made. The Commission believes that the need for immediate guidance to its staff and licensing boards, and to the interested public, requires publication of the present statement. The Commission will carefully consider the suggestions of the NRDC and, indeed, is aware that others should have the opportunity to comment on these proposals and to offer suggestions for implementing the recent court of appeals decisions.

While other questions were decided, the principal impact of the court's opinions on Commission actions arises from holdings on three related points:

1. A rule adopted by the former AEC in 1974 to codify the environmental effects of the uranium fuel cycle for individual light-water nuclear power reactors, 10 CFR 51.20(e), was inadequately supported insofar as it treated the reprocessing of spent fuel and of radioactive wastes;

2. The National Environmental Policy Act of 1969 requires analysis of these reprocessing and waste issues, either through rulemaking or in individual licensing proceedings, as a prerequisite to Commission licensing of a nuclear power plant;

3. If the Commission wishes to revise its rule, it must do so by procedures more demanding than the notice-and-comment procedures required for informal rule-

making by the Administrative Procedure Act. (The court divided 2-1 on the question of further procedures, Judge Tamm stating that notice-and-comment procedures would suffice.)

Even though review of one or more of these rulings may be sought, prudent and responsible regulation requires immediate steps to further analyze the reprocessing and waste disposal issues. Accordingly, the Commission's staff has been directed to review the existing literature thoroughly and to produce on an expedited basis a revised and adequately documented environmental survey on the probable contribution to the environmental costs of licensing a nuclear power reactor that is attributable to the reprocessing and waste management stages of the uranium fuel cycle. It is expected that this statement will be ready on or about September 30, 1976.

The Commission intends to reopen the rulemaking proceeding on the Environmental Effects of the Uranium Fuel Cycle, Docket RM-50-3 for the limited purposes of:

1. Supplementing the record on the reprocessing and waste management issues; and

2. Determining whether or not on the basis of the supplemented record, Table S-3 of 10 CFR 51.20(d) should be amended and, if so, in what respect.

The revised environmental survey just described, together with any amendments to Table S-3 that may be proposed as a consequence of that analysis, will be the basis for these reopened proceedings. We understand the court to regard the procedures originally used as capable of fully ventilating the issues involved, permitting a reasoned Commission

discussion and producing a valid rule.[1] These procedures, which included an oral hearing and questioning of witnesses by the presiding panel, are set forth at 38 Fed. Reg. 50, January 30, 1973. Alternative procedures, modeled on those to be employed by the Commission in its forthcoming GESMO hearings, have been suggested by the Natural Resources Defense Council in the petition for rulemaking referenced above. An election of procedures to be followed will be made in a forthcoming notice of hearing, following the comment period on that petition, which closes August 31, 1976.

While the extended rulemaking is in progress, the Commission and its licensing boards will be called upon to decide whether nuclear reactor licenses can issue, and whether previously granted licenses should be suspended, modified, or set aside.

In view of the court's recent decisions, the Commission has concluded that no new full-power operating license, construction permit or limited work authorization should be issued pending the developments to be described below. This conclusion is based on recognition that the grant of each of those authorizations, permits, or licenses is premised upon the completion of an adequate environmental impact statement, and that under the subject decisions, absent an acceptable substitute for those portions of Table S-3 which

[1] The court understood, as do we, that any such rule would be but one step in national planning for radioactive waste management. The Energy Research and Development Administration has undertaken a comprehensive environmental impact statement, now scheduled for issuance in draft form in April, 1977. A variety of other measures, including this agency's development of goals, objectives, and general environmental criteria for waste management, as also under way. As the Commission then proceeds to develop its regulatory framework for waste management, appropriate environmental impact statements will be prepared. Obviously, areas of uncertainty which may be developed by the present study will help to shape these efforts.

the court has found inadequately supported, the basis for a complete environmental impact statement will not be in place.

The Commission recognizes that this conclusion may have significant impacts on the availability and costs of nuclear power facilities. At present, two nuclear power plants are at the stage where an operating license might otherwise have been issued imminently; two plants will reach that stage within the next four months. Additionally, a decision on whether to issue construction permits for five power plants would in all probability have been reached by the end of the year. The number of plants affected by a cessation of licensing grows with time, and there are obvious costs incurred when plants stand idle. Since existing concepts for reprocessing and waste technology do not vary significantly with the design of nuclear power generating facilities, it is extremely unlikely that the revised environmental survey will result in any modification of these facilities. Only the possibility of discontinuing their construction or use is likely to be at issue.

The Commission does not believe that the licensing constraints here announced must necessarily continue until a rulemaking employing oral hearing procedures has been completed, a process which could take fully a year. If the revised environmental survey justifies, notice and comment rulemaking can provide the basis for an interim rule which would be an adequate substitute for Table S-3 pending issuance of the final rule. In addition to the revised environmental survey, the basis for such an interim rule would include an evaluation of the environmental impact of using that interim rule as a basis for licensing until the final rule is in place, and an assessment of the impact of a suspension of further licensing during that time period. The Commission has directed its staff to develop this information by

September 30, 1976. Since interim rulemaking would be accomplished through notice and comment procedures only, an interim rule might be promulgated as early as December 1976, providing a basis for licensing at that time.

The Commission also has under consideration the possibility of a future request to the court of appeals for a stay of its mandate, such a request to be explicitly supported by an appraisal of the likely impact of the court's decision and of granting the stay. If granted, a stay so supported might also provide the basis for resumed licensing.

Finally, some Commission licensing actions do not require preparation of an environmental impact statement, depending upon the circumstances. See 10 CFR 51.5(b). In these instances, which may include authorizations for fuel loading, low-power testing, or amending a construction permit, the Commission's regulations require that an environmental impact appraisal be undertaken in order to determine whether an environmental impact statement must be prepared. 10 CFR 51.5(c). The absence of an effective Table S-3 would not preclude licensing that is not dependent upon an environmental impact statement. Consequently the Commission is instructing its staff and licensing boards that they may continue to take such actions where an environmental impact assessment has been made and has resulted in a determination that no environmental impact statement need be prepared. See 10 CFR 51.5, 51.7.

In all other instances, the staff and the licensing boards shall continue to process applications and hold hearings up to the point of, but not including, licensing. However, in any contested proceeding, reprocessing and waste management issues should be deferred pending completion of the interim rulemaking, unless the evidentiary record on those issues has already been completed and is adequate for decision. The Commission wishes to avoid the needless duplication which proceeding both by rulemaking and in individual contested licensing hearings would entail and the overall delay that would result. Where a proceeding is uncontested, licensing shall nevertheless be deferred until the Commission has published the revised environmental survey, documenting the probable contribution to the environmental costs of licensing a nuclear power reactor which is attributable to the reprocessing and waste management stages of the uranium fuel cycle. These values may then be used in reaching a NEPA cost/benefit assessment prerequisite to licensing. Similarly, where a license has been issued, but the action has not become final within the Commission because of pending appeal or possible Commission review, final action or review should be deferred pending publication of the environmental survey; other issues, including as appropriate the issue of suspending activity under the license in question, may be resolved in the interim.

With regard to the *Vermont Yankee* and *Midland* licenses at issue in the two court of appeals cases, we agree with the view expressed by the Commission's staff that questions of modification or suspension should be resolved in formal proceedings in light of the facts and the applicable law. Since we have decided that reprocessing and waste management issues should be treated generically by rulemaking rather than on a case-by-case basis, the initial question on remand of the *Vermont Yankee* and *Midland* orders will be whether the licenses should be continued, modified, or suspended until an interim rule has been made effective. In resolving this question, the Commission intends to assign the matter to licensing boards with instructions to call for briefs from the parties followed by evidentiary hearings if necessary.[2] The same question would arise on a request for

[2] An evidentiary hearing on other issues will be required in *Midland*, barring further review. That hearing, however, should not be commenced until the *Midland* decision has become final.

a show cause order seeking the suspension or modification on fuel cycle rule grounds of any other nuclear power plant license.

It is the Commission's understanding that resolution of this question turns on equitable factors well established in prior practice and case law. Such factors include whether it is likely that significant adverse impact will occur until a new interim fuel cycle rule is in place; whether reasonable alternatives will be foreclosed by continued construction or operation; the effect of delay; and the possibility that the cost/benefit balance will be tilted through increased investment. See *Coalition for Safe Nuclear Power* v. *AEC*, 463 F.2d 954 (D.C. Cir. 1972); *San Onofre*, Units 2 and 3, 7 AEC 986, 996-97 (June 1974). General public policy concerns, the need for the project, the extent of the NEPA violation, and the timeliness of objections are also among the pertinent considerations. See, e.g., *Conservation Society of Southern Vermont Inc.* v. *Secretary of Transportation*, 408 F.2d 927, 933934 (2d Cir. 1974), *vacated on other grounds and remanded*, 423 U.S. 809 (1975); *Greene County Planning Board* v. *FPC*, 455 F.2d 412, 424-425 (2d Cir.), *cert. denied*, 409 U.S. 849 (1972); *City of New York* v. *United States*, 337 F. Supp. 150, 163 (E.D.N.Y.) (three-judge court).[3]

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[3] In its petition for rulemaking, noticed today, the Natural Resources Defense Council suggests that the appropriate course for the interim period concerning facilities which hold effective licenses should be as follows:

Facilities which received operating licenses before July 21, 1976:

NRC will order suspension of the operating license for any such facilities unless the licensee can establish that:

(1) Continued operation of the plant is essential to maintain a reliable supply of energy to the reliability region of which the plant is a part, taking into account alternative available sources of supply (including purchase power), historical reserve requirements, and available interconnections for transmitting power;

(2) Continued operation of the facility will provide adequate protection for the public health and safety, taking into account the health and

safety problems associated with production, storage, transportation, reprocessing, if any, and management or disposal of all nuclear fuel required for the plant and all nuclear wastes produced by the plant;

(3) Continued operation of the facility will not tend to foreclose, now or in the future, implementation of alternatives to the operation of this facility or to the design, construction or operation of other facilities which may be considered following completion of the review required by 10 CFR Section — ; and

(4) Continued operation of the facility will not tend to irretrievably commit resources to the production of nuclear fuel or the storage, reprocessing, if any, management or disposal of any nuclear wastes.

Facilities which received construction permits or LWA's prior to July 21, 1976:

NRC will order suspension of the LWA or the construction permit unless the licensee can establish that:

(1) Continued construction of the plant is essential to maintain a reliable supply of energy to the reliability region of which the plant is a part, taking into account alternative available sources of supply (including purchase power), historical reserve requirements and available interconnections for transmitting power;

(2) Continued construction will not tend to foreclose, now or in the future, implementation of alternatives to the design, construction or operation of this or other facilities which alternatives may be considered following completion of the review required by 10 CFR — ; and

(3) Continued construction will not tend to irretrievably commit resources to the facility.

As noted in the text immediately following this note, we believe the appropriate time for NRC consideration of *sua sponte*, across-the-board initiation of show cause proceedings to be when it has received from its staff its revised and documented assessment of the reprocessing and waste management issues. While the issues of reprocessing and waste management fully warrant serious and timely attention, no information now at hand calls for so drastic a step in the brief period before this analysis will be available. Also, while the individual factors NRDC suggests are among those relevant to be addressed in seeking a show cause order or in any show cause proceeding, the Commission cannot accept the suggestion that these factors are cumulative and must each be satisfied; its own approved prior practice and established judicial precedent permit balancing of these factors to determine where the equities of each particular case lie.

In adopting this approach, one inconsistent with the NRDC petition, the Commission is aware that neither NRDC nor other concerned parties have been formally heard. In commenting on the NRDC petition, any party interested to do so (including NRDC) may file comments addressed to the point.

Finally, even if no request for suspension or modification of an LWA, CP, or OL is received, the Commission will nevertheless determine whether it should *sua sponte* initiate show cause proceedings based upon information the Commission receives in the revised environmental survey. As noted earlier, this information should be in hand by September 30. The Commission's determination whether or not to reopen all licenses will then be issued.

FOR THE NUCLEAR
REGULATORY COMMISSION

SAMUEL J. CHILK
Secretary of the Commission

Dated at Washington, D.C.
this 13th day of August, 1976.

STATUTES AND REGULATIONS INVOLVED

Administrative Procedure Act, 5 U.S.C. § 553

(a) This section applies, according to the provisions thereof, except to the extent that there is involved —

(1) a military or foreign affairs function of the United States; or

(2) a matter relating to agency management or personnel or to public property, loans, grants, benefits, or contracts.

(b) General notice of proposed rule making shall be published in the Federal Register, unless persons subject thereto are named and either personally served or otherwise have actual notice thereof in accordance with law. The notice shall include —

(1) a statement of the time, place, and nature of public rule making proceedings;

(2) reference to the legal authority under which the rule is proposed; and

(3) either the terms or substance of the proposed rule or a description of the subjects and issues involved.

Except when notice or hearing is required by statute, this subsection does not apply —

(A) to interpretative rules, general statements of policy, or rules of agency organization, procedure, or practice; or

(B) when the agency for good cause finds (and incorporates the finding and a brief statement of reasons therefor in the rules issued) that notice and public procedure thereon are impracticable, unnecessary, or contrary to the public interest.

(c) After notice required by this section, the agency shall give interested persons an opportunity to participate in the rule making through submission of written data, views, or arguments with or without opportunity for oral presentation. After consideration of the relevant matter presented,

the agency shall incorporate in the rules adopted a concise general statement of their basis and purpose. When rules are required by statute to be made on the record after opportunity for an agency hearing, sections 556 and 557 of this title apply instead of this subsection.

(d) The required publication or services of a substantive rule shall be made not less than 30 days before its effective date, except —

(1) a substantive rule which grants or recognizes an exemption or relieves a restriction;

(2) interpretative rules and statements of policy; or

(3) as otherwise provided by the agency for good cause found and published with the rule.

(e) Each agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule. Pub.L. 89-554, Sept. 6, 1966, 80 Stat. 383.

"CHAPTER 1. DECLARATION, FINDINGS, AND PURPOSE

Declaration. 42 U.S.C. sec. 2011.

"SECTION 1. DECLARATION. — Atomic energy is capable of application for peaceful as well as military purposes. It is therefore declared to be the policy of the United States that —

"a. the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security; and

"b. the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.

Findings. 42 U.S.C. sec. 2012.

"SEC. 2. FINDINGS. — The Congress of the United States hereby makes the following findings concerning the development, use, and control of atomic energy:

"a. The development, utilization, and control of atomic energy for military and for all other purposes are vital to the common defense and security.

"c. The processing and utilization of source, byproduct, and special nuclear material affect interstate and foreign commerce and must be regulated in the national interest.

"d. The processing and utilization of source, byproduct, and special nuclear material must be regulated in the national interest and in order

to provide for the common defense and security and to protect the health and safety of the public.

"e. Source and special nuclear material, production facilities, and utilization facilities are affected with the public interest, and regulation by the United States of the production and utilization of atomic energy and of the facilities used in connection therewith is necessary in the national interest to assure the common defense and security and to protect the health and safety of the public.

"f. The necessity for protection against possible interstate damage occurring from the operation of facilities for the production or utilization of source or special nuclear material places the operation of those facilities in interstate commerce for the purposes of this Act.

"g. Funds of the United States may be provided for the development and use of atomic energy under conditions which will provide for the common defense and security and promote the general welfare.

"i. In order to protect the public and to encourage the development of the atomic energy industry, in the interest of the general welfare and of the common defense and security, the United States may make funds available for a portion of the damages suffered by the public from nuclear incidents, and may limit the liability of those persons liable for such losses.

Purpose.
42 U.S.C.
sec. 2013.

"SEC. 3. PURPOSE. — It is the purpose of this Act to effectuate the policies set forth above by providing for —

"a. a program of conducting, assisting, and fostering research and development in order to encourage maximum scientific and industrial progress;

"b. a program for the dissemination of unclassified scientific and technical information and for the control, dissemination, and declassification of Restricted Data, subject to appropriate safeguards, so as to encourage scientific and industrial progress;

"c. a program for Government control of the possession, use, and production of atomic energy and special nuclear material, whether owned by the Government or others, so directed as to make the maximum contribution to the common defense and security and the national welfare, and to provide continued assurance of the Government's ability to enter into and enforce agreements with nations or groups of nations for the control of special nuclear materials and atomic weapons.

"d. a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with the health and safety of the public;

"e. a program of international cooperation to promote the common defense and security and to make available to cooperating nations the benefits of peaceful applications of atomic energy as widely as expanding technology and considerations of the common defense and security will permit; and

"f. a program of administration which will be consistent with the foregoing policies and programs, with international arrangements, and with agreements for cooperation, which will enable the Congress to be currently informed so as to take further legislative action as may be appropriate.

Definitions. 42 U.S.C. sec. 2014.

"CHAPTER 2. DEFINITIONS

"SEC. 11. DEFINITIONS. — The intent of Congress in the definitions as given in this section should be construed from the words or phrases used in the definitions. As used in this Act:

Agency of the U.S.

"a. The term 'agency of the United States' means the executive branch of the United States, or any Government agency, or the legislative branch of the United States, or any agency, committee, commission, office, or other establishment in the legislative branch, or the judicial branch of the United States, or any office, agency, committee, commission, or other establishment in the judicial branch.

Agreement for cooperation.

"b. The term 'agreement for cooperation' means any agreement with another nation or regional defense organization authorized or permitted by sections 54, 57, 64, 82, 91 c., 103, 104, or 144, and made pursuant to section 123.

Atomic energy.

"c. The term 'atomic energy' means all forms of energy released in the course of nuclear fission or nuclear transformation.

Atomic weapon.

"d. The term 'atomic weapon' means any device utilizing atomic energy, exclusive of the means for transporting or propelling the device

(where such means is a separable and divisible part of the device), the principal purpose of which is for use as, or for development of, a weapon, a weapon prototype, or a weapon test device.

Byproduct materials.

"e. The term 'byproduct material' means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

Commission.

"f. The term 'Commission' means the Atomic Energy Commission.

Common defense and security.

"g. The term 'common defense and security' means the common defense and security of the United States.

Defense information.

"h. The term 'defense information' means any information in any category determined by any Government agency authorized to classify information, as being information respecting, relating to, or affecting the national defense.

Design.

"i. The term 'design' means (1) specifications, plans, drawings, blueprints, and other items of like nature; (2) the information contained therein; or (3) the research and development data pertinent to the information contained therein.

Extraordinary nuclear occurrence.

"j. The term 'extraordinary nuclear occurrence' means any event causing a discharge or dispersal of source, special nuclear, or byproduct material from its intended place of confinement in amounts offsite, or causing radiation levels offsite, which the Commission determines to be substantial, and which the Commission determines has resulted or will probably result

in substantial damages to persons offsite or property offsite. Any determination by the Commission that such an event has, or has not, occurred shall be final and conclusive, and no other official or any court shall have power or jurisdiction to review any such determination. The Commission shall establish criteria in writing setting forth the basis upon which such determination shall be made. As used in this subsection, 'offsite' means away from 'the location' or 'the contract location' as defined in the applicable Commission indemnity agreement, entered into pursuant to section 170.

Financial protection.

"k. The term 'financial protection' means the ability to respond in damages for public liability and to meet the costs of investigating and defending claims and settling suits for such damages.

Government agency.

"l. The term 'Government agency' means any executive department, commission, independent establishment, corporation, wholly or partly owned by the United States of America which is an instrumentality of the United States, or any board, bureau, division, service, office, officer, authority, administration, or other establishment in the executive branch of the Government.

Indemnitor.

"m. The term 'indemnitor' means (1) any insurer with respect to his obligations under a policy of insurance furnished as proof of financial protection; (2) any licensee, contractor or other person who is obligated under any other form of financial protection, with respect to such obligations; and (3) the Commission with

respect to any obligation undertaken by it in an indemnity agreement entered into pursuant to section 170.

International arrangement.

"n. The term 'international arrangement' means any international agreement hereafter approved by the Congress or any treaty during the time such agreement or treaty is in full force and effect, but does not include any agreement for cooperation.

Joint Committee.

"o. The term 'Joint Committee' means the Joint Committee on Atomic Energy.

Licensed activity.

"p. The term 'licensed activity' means an activity licensed pursuant to this Act and covered by the provisions of section 170a.

Nuclear incident.

"q. The term 'nuclear incident' means any occurrence, including an extraordinary nuclear occurrence, within the United States causing, within or outside the United States, bodily injury, sickness, disease, or death, or loss of or damage to property, or loss of use of property, arising out of or resulting from the radioactive, toxic, explosive, or other hazardous properties of source, special nuclear, or byproduct material: *Provided, however,* That as the term is used in subsection 170 l., it shall include any such occurrence outside of the United States: *And provided further,* That as the term is used in section 170d., it shall include any such occurrence outside of the United States if such occurrence involves a facility or device owned by, and used by or under contract with, the United States.

Operator.

"r. The term 'operator' means any individual who manipulates the controls of a utilization or production facility.

Person.

"s. The term 'person' means (1) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency other than the Commission, any State or any political subdivision of, or any politicai entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing.

Person indemnified.

"t. The term 'person indemnified' means (1) with respect to a nuclear incident occurring within the United States and with respect to any nuclear incident in connection with the design, development, construction, operation, repair, maintenance, or use of the nuclear ship Savannah, the person with whom an indemnity agreement is executed and any other person who may be liable for public liability; or (2) with respect to any other nuclear incident occurring outside the United States, the person with whom an indemnity agreement is executed and any other person who may be liable for public liability by reason of his activities under any contract with the Commission or any project to which indemnification under the provisions of section 170d. has been extended or under any subcontract, purchase order or other agreement, of any tier, under any such contract or project.

Produce.

"u. The term 'produce', when used in relation to special nuclear material, means (1) to manufacture, make, produce, or refine special nuclear material; (2) to separate special nuclear material from other substances in which such material may be contained; or (3) to make or to produce new special nuclear material.

Production facility.

"v. The term 'production facility' means (1) any equipment or device determined by rule of the Commission to be capable of the production of special nuclear material in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public; or (2) any important component part especially designed for such equipment or device as determined by the Commission.

Public liability.

"w. The term 'public liability' means any legal liability arising out of or resulting from a nuclear incident, except: (i) claims under State or Federal workmen's compensation acts of employees of persons indemnified who are employed at the site of and in connection with the activity where the nuclear incident occurs; (ii) claims arising out of an act of war; and (iii) whenever used in subsections 170 a., c., and k., claims for loss of, or damage to, or loss of use of property which is located at the site of and used in connection with the licensed activity where the nuclear incident occurs. 'Public liability' also includes damage to property of persons indemnified: *Provided,* That such property is covered under the terms of the financial protection required, except property which is located at the site of and used in connection with the activity where the nuclear incident occurs.

Research and development.

"x. The term 'research and development' means (1) theoretical analysis, exploration, or experimentation; or (2) the extension of inves-

tigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes.

Restricted Data.

"y. The term 'Restricted Data' means all data concerning (1) design, manufacture, or utilization of atomic weapons; (2) the production of special nuclear material; or (3) the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the Restricted Data category pursuant to section 142.

Source material.

"z. The term 'source material' means (1) uranium, thorium, or any other material which is determined by the Commission pursuant to the provisions of section 61 to be source material; or (2) ores containing one or more of the foregoing materials, in such concentration as the Commission may by regulation determine from time to time.

Special nuclear material.

"aa. The term 'special nuclear material' means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51, determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.

United States.

"bb. The term 'United States' when used in a geographical sense includes all Territories and possessions of the United States, the Canal Zone and Puerto Rico.

Utilization facility.

"cc. The term 'utilization facility' means (1) any equipment or device, except an atomic weapon, determined by rule of the Commission to be capable of making use of special nuclear material in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public, or peculiarly adapted for making use of atomic energy in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public; or (2) any important component part especially designed for such equipment or device as determined by the Commission.

"CHAPTER 10.

ATOMIC ENERGY LICENSES

License required. 42 U.S.C. sec. 2131.

"SEC. 101. LICENSE REQUIRED. — It shall be unlawful, except as provided in section 91, for any person within the United States to transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, use, import, or export any utilization or production facility except under and in accordance with a license issued by the Commission pursuant to section 103 or 104.

42 U.S.C. sec. 2132.

"SEC. 102. UTILIZATION AND PRODUCTION FACILITIES FOR INDUSTRIAL OR COMMERCIAL PURPOSES. —

"a. Except as provided in subsections b. and c., or otherwise specifically authorized by law, any license hereafter issued for a utilization or

production facility for industrial or commercial purposes shall be issued pursuant to section 103.

"b. Any license hereafter issued for a utilization or production facility for industrial or commercial purposes, the construction or operation of which was licensed pursuant to subsection 104 b. prior to enactment into law of this subsection, shall be issued under subsection 104 b.

"c. Any license for a utilization or production facility for industrial or commercial purposes contructed or operated under an arrangement with the Commission entered into under the Cooperative Power Reactor Demonstration Program shall, except as otherwise specifically required by applicable law, be issued under subsection 104 b.

Commercial licenses. 42 U.S.C. sec. 2133.

"SEC. 103. COMMERCIAL LICENSES. —

"a. The Commission is authorized to issue licenses to persons applying therefore to transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, use, import, or export under the terms of an agreement for cooperation arranged pursuant to section 123, utilization or production facilities for industrial or commercial purposes. Such licenses shall be issued in accordance with the provisions of chapter 16 and subject to such conditions as the Commission may by rule or regulation establish to effectuate the purposes and provisions of this Act.

"b. The Commission shall issue such licenses on a non-exclusive basis to persons applying therefor (1) whose proposed activities will

serve a useful purpose proportionate to the quantities of special nuclear material or source material to be utilized; (2) who are equipped to observe and who agree to observe such safety standards to protect health and to minimize danger to life or property as the Commission may by rule establish; and (3) who agree to make available to the Commission such technical information and data concerning activities under such licenses as the Commission may determine necessary to promote the common defense and security and to protect the health and safety of the public. All such information may be used by the Commission only for the purposes of the common defense and security and to protect the health and safety of the public.

"c. Each such license shall be issued for a specified period, as determined by the Commission, depending on the type of activity to be licensed, but not exceeding forty years, and may be renewed upon the expiration of such period.

"d. No license under this section may be given to any person for activities which are not under or within the jurisdiction of the United States, except for the export of production or utilization facilities under terms of an agreement for cooperation arranged pursuant to section 123, or except under the provisions of section 109. No license may be issued to an alien or any corporation or other entity if the Commission knows or has reason to believe it is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. In any event, no license may be issued to any person

within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public.

Medical therapy and research and development. 42 U.S.C. sec. 2134.

"SEC. 104. MEDICAL THERAPY AND RESEARCH AND DEVELOPMENT. —

"a. The Commission is authorized to issue licenses to persons applying therefor for utilization facilities for use in medical therapy. In issuing such licenses the Commission is directed to permit the widest amount of effective medical therapy possible with the amount of special nuclear material available for such purposes and to impose the minimum amount of regulation consistent with its obligations under this Act to promote the common defense and security and to protect the health and safety of the public.

"b. As provided for in subsection 102b. or 102c., or where specifically authorized by law, the Commission is authorized to issue licenses under this subsection to persons applying therefor for utilization and production facilities for industrial and commercial purposes. In issuing licenses under this subsection, the Commission shall impose the minimum amount of such regulations and terms of license as will permit the Commission to fulfill its obligations under this Act.

"c. The Commission is authorized to issue licenses to persons applying therefor for utiliza-

tion and production facilities useful in the conduct of research and development activities of the types specified in section 31 and which are not facilities of the type specified in subsection 104b. The Commission is directed to impose only such minimum amount of regulation of the licensee as the Commission finds will permit the Commission to fulfill its obligations under this Act to promote the common defense and security and to protect the health and safety of the public and will permit the conduct of widespread and diverse research and development.

"d. No license under this section may be given to any person for activities which are not under or within the jurisdiction of the United States, except for the export of production or utilization facilities under terms of an agreement for cooperation arranged pursuant to section 123 or except under the provisions of section 109. No license may be issued to any corporation or other entity if the Commission knows or has reason to believe it is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. In any event, no license may be issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public.

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Classes of facilities. 42 U.S.C. sec. 2136.

"SEC. 106. CLASSES OF FACILITIES. — The Commission may —

"a. group the facilities licensed either under section 103 or under section 104 into classes which may include either production or utilization facilities or both, upon the basis of the similarity of operating and technical characteristics of the facilities;

"b. define the various activities to be carried on at each such class of facility; and

"c. designate the amounts of special nuclear material available for use by each such facility.

Operators' licenses. 42 U.S.C. sec. 2137.

"SEC. 107. OPERATORS' LICENSES. — The Commission shall —

"a. prescribe uniform conditions for licensing individuals as operators of any of the various classes of production and utilization facilities licensed in this Act;

"b. determine the qualifications of such individuals;

"c. issue licenses to such individuals in such form as the Commission may prescribe; and

"d. suspend such licenses for violations of any provision of this Act or any rule or regula-

tion issued thereunder whenever the Commission deems such action desirable.

War or national emergency. 42 U.S.C. sec. 2138.

"SEC. 108. WAR OR NATIONAL EMERGENCY. — Whenever the Congress declares that a state of war or national emergency exists, the Commission is authorized to suspend any licenses granted under this Act if in its judgment such action is necessary to the common defense and security. The Commmission is authorized during such period, if the Commission finds it necessary to the common defense and security, to order the recapture of any special nuclear material or to order the operation of any facility licensed under section 103 or 104, and is authorized to order the entry into any plant or facility in order to recapture such material, or to operate such facility. Just compensation shall be paid for any damages caused by the recapture of any special nuclear material or by the operation of any such facility.

Component parts of facilities. 42 U.S.C. sec. 2139.

"SEC. 109. COMPONENT PARTS OF FACILITIES. — With respect to those utilization and production facilities which are so determined by the Commission pursuant to subsection 11 v. (2) or 11 cc. the Commission may (a) issue general licenses for activities required to be licensed under section 101, if the Commission determines in writing that such general licensing will not constitute an unreasonable risk to the com-

mon defense and security, and (b) issue licenses for the export of such facilities, if the Commission determines in writing that each export will not constitute an unreasonable risk to the common defense and security.

Exclusions. 42 U.S.C. sec. 2140.

"SEC. 110. EXCLUSIONS. — Nothing in this chapter shall be deemed —

"a. to require a license for (1) the processing, fabricating, or refining of special nuclear material, or the separation of special nuclear material, or the separation of special nuclear material from other substances, under contract with and for the account of the Commission; or (2) the construction or operation of facilities under contract with and for the account of the Commission; or

"b. to require a license for the manufacture, production, or acquisition by the Department of Defense of any utilization facility authorized pursuant to section 91, or for the use of such facility by the Department of Defense or a contractor thereof.

"CHAPTER 14. GENERAL AUTHORITY

General provisions. 42 U.S.C. sec. 2201.

"SEC. 161. GENERAL PROVISIONS. — In the performance of its functions the Commission is authorized to —

"a. establish advisory boards to advise with and make recommendations to the Commission on legislation, policies, administration, research, and other matters, provided that the Commission issues regulations setting forth the scope, procedure, and limitations of the authority of each such board;

"b. establish by rule, regulation, or order, such standards and instructions to govern the possession and use of special nuclear material, source material, and byproduct material as the Commission may deem necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property;

"c. make such studies and investigations, obtain such information, and hold such meetings or hearings as the Commission may deem necessary or proper to assist it in exercising any authority provided in this Act, or in the administration or enforcement of this Act, or any regulations or orders issued thereunder. For such purposes the Commission is authorized to administer oaths and affirmations, and by subpena to require any person to appear and testify, or to appear and produce documents, or both, at any designated place. Witnesses subpenaed under this subsection shall be paid the same fees and mileage as are paid witnesses in the district courts of the United States; 27 Stat. 443, 49 U.S.C. 46.

"d. appoint and fix the compensation of such officers and employees as may be necessary to carry out the functions of the Commission. Such officers and employees shall be appointed in accordance with the civil-service laws and their compensation fixed in accordance with the Classification Act of 1949, as amended, except that, to the extent the Commission deems such action 80 Stat. 443, 5 U.S.C. 5101.

necessary to the discharge of its responsibilities, personnel may be employed and their compensation fixed without regard to such laws: *Provided, however,* That no officer or employee (except such officers and employees whose compensation is fixed by law, and scientific and technical personnel up to a limit of the highest rate of grade 18 of the General Schedule of the Classification Act of 1949, as amended) whose position would be subject to the Classification Act of 1949, as amended, if such Act were applicable to such position, shall be paid a salary at a rate in excess of the rate payable under such Act for positions of equivalent difficulty or responsibility. Such rates of compensation may be adopted by the Commission as may be authorized by the Classification Act of 1949, as amended, as of the same date such rates are authorized for positions subject to such Act. The Commission shall make adequate provision for administrative review of any determination to dismiss any employee;

"e. acquire such material, property, equipment, and facilities, establish or construct such buildings and facilities, and modify such buildings and facilities from time to time, as it may deem necessary, and construct, acquire, provide, or arrange for such facilities and services (at project sites where such facilities and services are not available) for the housing, health, safety, welfare, and recreation of personnel employed by the Commission as it may deem necessary, subject to the provisions of section 174: *Provided, however,* That in the communities owned by the Commission, the Commission is

authorized to grant privileges, leases and permits upon adjusted terms which (at the time of the initial grant of any privilege, grant, lease, or permit, or renewal thereof, or in order to avoid inequities or undue hardship prior to the sale by the United States of property affected by such grant) are fair and reasonable to responsible persons to operate commercial businesses without advertising and without advertising (sic) and without securing competitive bids, but taking into consideration, in addition to the price, and among other things (1) the quality and type of services required by the residents of the community, (2) the experience of each concession applicant in the community and its surrounding area, (3) the ability of the concession applicant to meet the needs of the community, and (4) the contribution the concession applicant has made or will make to the other activities and general welfare of the community;

"f. with the consent of the agency concerned, utilize or employ the services of personnel of any Government agency or any State or local government, or voluntary or uncompensated personnel, to perform such functions on its behalf as may appear desirable;

"g. acquire, purchase, lease, and hold real and personal property, including patents, as agents of and on behalf of the United States subject to the provisions of section 174, and to sell, lease, grant, and dispose of such real and personal property as provided in this Act;

"h. consider in a single application one or more of the activities for which a license is required by this Act, combine in a single license

one or more of such activities, and permit the applicant or licensee to incorporate by reference pertinent information already filed with the Commission;

"i. prescribe such regulations or orders as it may deem necessary (1) to protect Restricted Data received by any person in connection with any activity authorized pursuant to this Act, (2) to guard against the loss or diversion of any special nuclear material acquired by any person pursuant to section 53 or produced by any person in connection with any activity authorized pursuant to this Act, to prevent any use or disposition thereof which the Commission may determine to be inimical to the common defense and security, including regulations or orders designating activities, involving quantities of special nuclear material which in the opinion of the Commission are important to the common defense and security, that may be conducted only by persons whose character, associations, and loyalty shall have been investigated under standards and specifications established by the Commission and as to whom the Commission shall have determined that permitting each such person to conduct the activity will not be inimical to the common defense and security, and (3) to govern any activity authorized pursuant to this Act, including standards and restrictions governing the design, location, and operation of facilities used in the conduct of such activity, in order to protect health and to minimize danger to life or property;".

63 Stat. 377, 40 U.S.C. 471 note, 488.

"j. without regard to the provisions of the Federal Property and Administrative Services

Act of 1949, as amended, except section 207 of that Act, or any other law, make such disposition as it may deem desirable of (1) radioactive materials, and (2) any other property, the special disposition of which is, in the opinion of the Commission, in the interest of the national security: *Provided, however,* That the property furnished to licensees in accordance with the provisions of subsection 161 m. shall not be deemed to be properly disposed of by the Commission pursuant to this subsection;

"k. authorize such of its members, officers, and employees as it deems necessary in the interest of the common defense and security to carry firearms while in the discharge of their official duties. The Commission may also authorize such of those employees of its contractors engaged in the protection of property owned by the United States and located at facilities owned by or contracted to the United States as it deems necessary in the interests of the common defense and security to carry firearms while in the discharge of their official duties;

"m. enter into agreements with persons licensed under Section 103, 104, 53 a. (4), or 63 a. (4) for such periods of time as the Commission may deem necessary or desirable (1) to provide for the processing, fabricating, separating, or refining in facilities owned by the Commission of source, byproduct, or other material or special nuclear material owned by or made available to such licensees and which is utilized or produced in the conduct of the licensed activity, and (2) to sell, lease, or otherwise make available to such licensees such quantities of source

or byproduct material, and other material not defined as special nuclear material pursuant to this Act, as may be necessary for the conduct of the licensed activity: *Provided, however,* That any such agreement may be canceled by the licensee at any time upon payment of such reasonable cancellation charges as may be agreed upon by the licensee and the Commission: *And provided further,* That the Commission shall establish prices to be paid by licensees for material or services to be furnished by the Commission pursuant to this subsection, which prices shall be established on such a nondiscriminatory basis as, in the opinion of the Commission, will provide reasonable compensation to the Government for such material or services and will not discourage the development of sources of supply independent of the Commission;

"n. delegate to the General Manager or other officers of the Commission any of those functions assigned to it under this Act except those specified in sections 51, 57 b., 61, 108, 123, 145b. (with respect to the determination of those persons to whom the Commission may reveal Restricted Data in the national interest), 145 f., and 161 a.;

"o. require by rule, regulation, or order, such reports, and the keeping of such records with respect to, and to provide for such inspections of, activities and studies of types specified in section 31 and of activities under licenses issued pursuant to sections 53, 63, 81, 103, and 104, as may be necessary to effectuate the purposes of this Act, including section 105; and

"p. make, promulgate, issue, rescind, and amend such rules and regulations as may be necessary to carry out the purposes of this Act.

Easements for rights-of-way.

"q. The Commission is authorized and empowered, under such terms and conditions as are deemed advisable by it, to grant easements for rights-of-way over, across, in, and upon acquired lands under its jurisdiction and control, and public lands permanently withdrawn or reserved for the use of the Commission, to any State, political subdivision thereof, or municipality, or to any individual, partnership, or corporation of any State, Territory, or possession of the United States, for (a) railroad tracks; (b) oil pipe lines; (c) substations for electric power transmission lines, telephone lines, and telegraph lines, and pumping stations for gas, water, sewer, and oil pipe lines; (d) canals; (e) ditches; (f) flumes; (g) tunnels; (h) dams and reservoirs in connection with fish and wildlife programs, fish hatcheries, and other fish-cultural improvements; (i) roads and streets; and (j) for any other purpose or purposes deemed advisable by the Commission: *Provided,* That such rights-of-way shall be granted only upon a finding by the Commission that the same will not be incompatible with the public interest: *Provided further,* That such rights-of-way shall not include any more land than is reasonably necessary for the purpose for which granted: *And provided further,* That all or any part of such rights-of-way may be annulled and forfeited by the Commission for failure to comply with the terms and conditions of any grant hereunder or for nonuse for a

period of two consecutive years or abandonment of rights granted under authority hereof. Copies of all instruments granting easements over public lands pursuant to this section shall be furnished to the Secretary of the Interior.

"r. Under such regulations and for such periods and at such prices the Commission may prescribe, the Commission may sell or contract to sell to purchasers within Commission-owned communities or in the immediate vicinity of the Commission community, as the case may be, any of the following utilities and related services, if it is determined that they are not available from another local source and that the sale is in the interest of the national defense or in the public interest:

"(1) Electric power.
"(2) Steam.
"(3) Compressed air.
"(4) Water.
"(5) Sewage and garbage disposal.
"(6) Natural, manufactured, or mixed gas.
"(7) Ice.
"(8) Mechanical refrigeration.
"(9) Telephone service.

"Proceeds of sales under this subsection shall be credited to the appropriation currently available for the supply of that utility or service. To meet local needs the Commission may make minor expansions and extensions of any distributing system or facility within or in the immediate vicinity of a Commission-owned community through which a utility or service is furnished under this subsection.

Succession of authority.

"s. establish a plan for a succession of authority which will assure the continuity of direction of the Commission's operations in the event of a national disaster due to enemy activity. Notwithstanding any other provision of this Act, the person or persons succeeding to command in the event of disaster in accordance with the plan established pursuant to this subsection shall be vested with all of the authority of the Commission: *Provided,* That any such succession to authority, and vesting of authority shall be effective only in the event and as long as a quorum of three or more members of the Commission is unable to convene and exercise direction during the disaster period: *Provided further,* That the disaster period includes the period when attack on the United States is imminent and the post-attack period necessary to reestablish normal lines of command;

"t. enter into contracts for the processing, fabricating, separating, or refining in facilities owned by the Commission of source, byproduct or other material, or special nuclear material, in accordance with and within the period of an agreement for cooperation while comparable services are available to persons licensed under section 103 or 104: *Provided,* That the prices for services under such contracts shall be no less than the prices currently charged by the Commission pursuant to section 161m.;

Processing contracts.

"u. (1) enter into contracts for such periods of time as the Commission may deem necessary or desirable, but not to exceed five years from the date of execution of the contract, for the

Long term contract authority.

purchase or acquisition of reactor services or services related to or required by the operation of reactors;

"(2) (A) enter into contracts for such periods of time as the Commission may deem necessary or desirable for the purchase or acquisition of any supplies, equipment, materials, or services required by the Commission whenever the Commission determines that: (i) it is advantageous to the Government to make such purchase or acquisition from commercial sources; (ii) the furnishing of such supplies, equipment, materials, or services will require the construction or acquisition of special facilities by the vendors or suppliers thereof; (iii) the amortization chargeable to the Commission constitutes an appreciable portion of the cost of contract performance, excluding cost of materials; and (iv) the contract for such period is more advantageous to the Government than a similar contract not executed under the authority of this subsection. Such contracts shall be entered into for periods not to exceed five years each from the date of initial delivery of such supplies, equipment, materials, or services or ten years from the date of execution of the contracts excluding periods of renewal under option.

"(B) In entering into such contracts the Commission shall be guided by the following principles: (i) the percentage of the total cost of special facilities devoted to contract performance and chargeable to the Commission should not exceed the ratio between the period of contract deliveries and the anticipated useful life of such

special facilities; (ii) the desirability of obtaining options to renew the contract for reasonable periods at prices not to include charges for special facilities already amortized; and (iii) the desirability of reserving in the Commission the right to take title to the special facilities under appropriate circumstances; and

"(3) include in contracts made under this subsection provisions which limit the obligation of funds to estimated annual deliveries and services and the unamortized balance of such amounts due for special facilities as the parties shall agree is chargeable to the performance of the contract. Any appropriation available at the time of termination or thereafter made available to the Commission for operating expenses shall be available for payment of such costs which may arise from termination as the contract may provide. The term 'special facilities' as used in this subsection means any land and any depreciable buildings, structures, utilities, machinery, equipment, and fixtures necessary for the production or furnishing of such supplies, equipment, materials, or services and not available to the vendors or suppliers for the performance of the contract.

"v. (A) enter into contracts with persons licensed under sections 53, 63, 103 or 104 for such periods of time as the Commission may deem necessary or desirable to provide, after December 31, 1968, for the producing or enriching of special nuclear material in facilities owned by the Commission; and

Contract authority.

"(B) enter into contracts to provide, after December 31, 1968, for the producing or enriching of special nuclear material in facilities owned by the Commission in accordance with and within the period of an agreement for cooperation arranged pursuant to section 123 while comparable services are made available pursuant to paragraph (A) of this subsection:

Provided, That (i) prices for services under paragraph (A) of this subsection shall be established on a nondiscriminatory basis; (ii) prices for services under paragraph (B) of this subsection shall be no less than prices under paragraph (A) of this subsection; and (iii) any prices established under this subsection shall be on a basis of recovery of the Government's costs over a reasonable period of time: *And provided further,* That the Commission, to the extent necessary to assure the maintenance of a viable domestic uranium industry, shall not offer such services for source or special nuclear materials of foreign origin intended for use in a utilization facility within or under the jurisdiction of the United States. The Commission shall establish criteria in writing setting forth the terms and conditions under which services provided under this subsection shall be made available including the extent to which such services will be made available for source or special nuclear material of foreign origin intended for use in a utilization facility within or under the jurisdiction of the United States: *Provided,* That before the Commission establishes such criteria, the proposed criteria shall be submitted to the Joint

Committee, and a period of forty-five days shall elapse while Congress is in session (in computing the forty-five days there shall be excluded the days in which either House is not in session because of adjournment for more than three days) unless the Joint Committee by resolution in writing waives the conditions of, or all or any portion of, such forty-five day period.

"w. prescribe and collect from any other Government agency, which applies for or is issued a license for a utilization facility designed to produce electrical or heat energy pursuant to section 103 or 104b, any fee, charge, or price which it may require, in accordance with the provisions of section 483a of title 31 of the United States Code or any other law, of applicants for, or holders of, such licenses.

"SEC. 162. CONTRACTS. — The President may, in advance, exempt any specific action of the Commission in a particular matter from the provisions of law relating to contracts whenever he determines that such action is essential in the interest of the common defense and security. Contracts. 42 U.S.C. sec. 2202.

"SEC. 163. ADVISORY COMMITTEES. — The members of the General Advisory Committee established pursuant to section 26 and the members of advisory boards established pursuant to section 161 a. may serve as such without regard to the provisions of sections 281, 283, or 284 of Title 18 of the United States Code, except insofar as such sections may prohibit any such member from receiving compensation from a Advisory committees. 42 U.S.C. sec. 2203. 62 Stat. 697.

source other than a nonprofit educational institution in respect of any particular matter which directly involves the Commission or in which the Commission is directly interested.

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"CHAPTER 16. JUDICIAL REVIEW AND ADMINISTRATIVE PROCEDURE

General.
60 Stat. 381-388, 5 U.S.C. 551-559. 42 U.S.C. sec. 2231.

"SEC. 181. GENERAL. — The provisions of the Administrative Procedure Act (Public Law 404, Seventy-ninth Congress, approved June 11, 1946) shall apply to all agency action taken under this Act, and the terms 'agency' and 'agency action' shall have the meaning specified in the Administration Procedure Act: *Provided, however,* That in the case of agency proceedings or actions which involve Restricted Data or defense information, the Commission shall provide by regulation for such parallel procedures as will effectively safeguard and prevent disclosure of Restricted Data or defense information to unauthorized persons with minimum impairment of the procedural rights which would be available if Restricted Data or defense information were not involved.

License applications. 42 U.S.C. sec. 2232.

"SEC. 182. LICENSE APPLICATIONS. —

"a. Each application for a license hereunder shall be in writing and shall specifically state

such information as the Commission, by rule or regulation, may determine to be necessary to decide such of the technical and financial qualifications of the applicant, the character of the applicant, the citizenship of the applicant, or any other qualifications of the applicant as the Commission may deem appropriate for the license. In connection with applications for licenses to operate production or utilization facilities, the applicant shall state such technical specifications, including information of the amount, kind, and source of special nuclear material required, the place of the use, the specific characteristics of the facility, and such other information as the Commission may, by rule or regulation, deem necessary in order to enable it to find that the utilization or production of special nuclear material will be in accord with the common defense and security and will provide adequate protection to the health and safety of the public. Such technical specifications shall be a part of any license issued. The Commission may at any time after the filing of the original application, and before the expiration of the license, require further written statements in order to enable the Commission to determine whether the application should be granted or denied or whether a license should be modified or revoked. All applications and statements shall be signed by the applicant or licensee. Applications for, and statements made in connection with, licenses under sections 103 and 104 shall be made under oath or affirmation. The Commission may require any other applications or statements to be made under oath or affirmation.

ACRS Report.

"b. The Advisory Committee on Reactor Safeguards shall review each application under section 103 or section 104 b. for a construction permit or an operating license for a facility, any application under section 104 c. for a construction permit or an operating license for a testing facility, any application under section 104 a. or c. specifically referred to it by the Commission, and any application for an amendment to a construction permit or an amendment to an operating license under section 103 or 104 a., b., or c. specifically referred to it by the Commission, and shall submit a report thereon which shall be made part of the record of the application and available to the public except to the extent that security classification prevents disclosure.

Commercial power.

"c. The Commission shall not issue any license under section 103 for a utilization or production facility for the generation of commercial power until it has given notice in writing to such regulatory agency as may have jurisdiction over the rates and services incident to the proposed activity; until it has published notice of the application in such trade or news publications as the Commission deems appropriate to give reasonable notice to municipalities, private utilities, public bodies, and cooperatives which might have a potential interest in such utilization or production facility; and until it has published notice of such application once each week for four consecutive weeks in the Federal Register, and until four weeks after the last notice.

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"d. The Commission, in issuing any license for a utilization or production facility for the generation of commercial power under section 103, shall give preferred consideration to applications for such facilities which will be located in high cost power areas in the United States if there are conflicting applications for a limited opportunity for such license. Where such conflicting applications resulting from limited opportunity for such license include those submitted by public or cooperative bodies such applications shall be given preferred consideration.

"SEC. 183. TERMS OF LICENSES. — Each license shall be in such form and contain such terms and conditions as the Commission may, by rule or regulation, prescribe to effectuate the provisions of this Act, including the following provisions:

Terms of licenses. 42 U.S.C. sec. 2233.

"b. No right to the special nuclear material shall be conferred by the license except as defined by the license.

"c. Neither the license nor any right under the license shall be assigned or otherwise transferred in violation of the provisions of this Act.

"d. Every license issued under this Act shall be subject to the right of recapture or control reserved by section 108, and to all of the other provisions of this Act, now or hereafter in effect and to all valid rules and regulations of the Commission.

Inalienability of licenses. 42 U.S.C. sec. 2234.

"SEC. 184. INALIENABILITY OF LICENSES.— No license granted hereunder and no right to utilize or produce special nuclear material granted hereby shall be transferred, assigned or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person, unless the Commission shall, after securing full information, find that the transfer is in accordance with the provisions of this Act, and shall give its consent in writing. The Commission may give such consent to the creation of a mortgage, pledge, or other lien upon any facility or special nuclear material, owned or thereafter acquired by a licensee, or upon any leasehold or other interest in such facility, and the rights of the creditors so secured may thereafter be enforced by any court subject to rules and regulations established by the Commission to protect public health and safety and promote the common defense and security.

Construction permits. 42 U.S.C. sec. 2235.

"SEC. 185. CONSTRUCTION PERMITS. — All applicants for licenses to construct or modify production or utilization facilities shall, if the application is otherwise acceptable to the Commission, be initially granted a construction permit. The construction permit shall state the earliest and latest dates for the completion of the construction or modification. Unless the construction or modification of the facility is completed by the completion date, the construction permit shall expire, and all rights thereunder be forfeited, unless upon good cause shown, the Commission extends the completion

date. Upon the completion of the construction or modification of the facility, upon the filing of any additional information needed to bring the original application up to date, and upon finding that the facility authorized has been constructed and will operate in conformity with the application as amended and in conformity with the provisions of this Act and of the rules and regulations of the Commission, and in the absence of any good cause being shown to the Commission why the granting of a license would not be in accordance with the provisions of this Act, the Commission shall thereupon issue a license to the applicant. For all other purposes of this Act, a construction permit is deemed to be a 'license'.

Revocation. 42 U.S.C. sec. 2236.

"SEC. 186. REVOCATION. —

"a. Any license may be revoked for any material false statement in the application or any statement of fact required under section 182, or because of conditions revealed by such application or statement of fact or any report, record, or inspection or other means which would warrant the Commission to refuse to grant a license on an original application, or for failure to construct or operate a facility in accordance with the terms of the construction permit or license or the technical specifications in the application, or for violation of, or failure to observe any of the terms and provisions of this Act or of any regulation of the Commission.

80 Stat. 388, 5 U.S.C. 588(b).

"b. The Commission shall follow the provisions of section 9(b) of the Administrative Procedure Act in revoking any license.

"c. Upon revocation of the license, the Commission may immediately retake possession of all special nuclear material held by the licensee. In cases found by the Commission to be of extreme importance to the national defense and security or to the health and safety of the public, the Commission may recapture any special nuclear material held by the licensee or may enter upon and operate the facility prior to any of the procedures provided under the Administrative Procedure Act. Just compensation shall be paid for the use of the facility.

5 U.S.C. 551.

Modification of license. 42 U.S.C. sec. 2237.

"SEC. 187. MODIFICATION OF LICENSE. — The terms and conditions of all licenses shall be subject to amendment, revision, or modification, by reason of amendments of this Act, or by reason of rules and regulations issued in accordance with the terms of this Act.

Continued operation of facilities. 42 U.S.C. sec. 2238.

"SEC. 188. CONTINUED OPERATION OF FACILITIES. — Whenever the Commission finds that the public convenience and necessity or the production program of the Commission requires continued operation of a production facility or utilization facility the license for which has been revoked pursuant to section 186, the Commission may, after consultation with the appropriate regulatory agency, State or Federal, having jurisdiction, order that possession be taken of and such facility be operated for such period of time as the public convenience and necessity or the production program of the Commission may, in the judgment of the Commission, require, or until a license for the operation of the facility

shall become effective. Just compensation shall be paid for the use of the facility.

Hearings and judicial review. 42 U.S.C. sec. 2239.

"SEC. 189. HEARINGS AND JUDICIAL REVIEW. —

"a. In any proceeding under this Act, for the granting, suspending, revoking, or amending of any license or construction permit, or application to transfer control, and in any proceeding for the issuance or modification of rules and regulations dealing with the activities of licensees, and in any proceeding for the payment of compensation, an award, or royalties under sections 153, 157, 186 c., or 188, the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding. The Commission shall hold a hearing after thirty days' notice and publication once in the Federal Register, on each application under section 103 or 104 b. for a construction permit for a facility, and on any application under section 104 c. for a construction permit for a testing facility. In cases where such a construction permit has been issued following the holding of such a hearing, the Commission may, in the absence of a request therefor by any person whose interest may be affected, issue an operating license or an amendment to a construction permit or an amendment to an operating license without a hearing, but upon thirty days' notice and publication once in the Federal Register of its intent to do so. The Commission may dispense with such thirty days' notice and publication with respect to any application for an amendment to a construction per-

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mit or an amendment to an operating license upon a determination by the Commission that the amendment involves no significant hazards consideration.

"b. Any final order entered in any proceeding of the kind specified in subsection a. above shall be subject to judicial review in the manner prescribed in the Act of December 29, 1950, as amended (ch. 1189, 64 Stat. 1129), and to the provisions of section 10 of the Administrative Procedure Act, as amended.

5 U.S.C. 701-706, 28 U.S.C. 2341-2352.

"SEC. 190. LICENSEE INCIDENT REPORTS. — No report by any licensee of any incident arising out of or in connection with a licensed activity made pursuant to any requirement of the Commission shall be admitted as evidence in any suit or action for damages growing out of any matter mentioned in such report.

42 U.S.C. sec. 2240.

"SEC. 191. ATOMIC SAFETY AND LICENSING BOARD. —

Atomic Safety and Licensing Board. 80 Stat. 386, 387, 5 U.S.C. 556, 557. 42 U.S.C. sec. 2241.

"a. Notwithstanding the provisions of sections 7(a) and 8(a) of the Administrative Procedure Act, the Commission is authorized to establish one or more atomic safety and licensing boards, each comprised of three members, one of whom shall be qualified in the conduct of administrative proceedings and two of whom shall have such technical or other qualifications as the Commission deems appropriate to the issues to be decided, to conduct such hearings as the Commission may direct and make such intermediate or final decisions as the Commission may authorize with respect to the granting, suspending, revoking or amending of any license or authorization under the provisions of this Act, any other provision of law, or any regulation of the Commission issued thereunder. The Commission may delegate to a board such other regulatory functions as the Commission deems appropriate. The Commission may appoint a panel of qualified persons from which board members may be selected.

"b. Board members may be appointed by the Commission from private life, or designated from the staff of the Commission or other Federal agency. Board members appointed from private life shall receive a per diem compensation for each day spent in meetings or conferences, and all members shall receive their necessary traveling or other expenses while engaged in the work of a board. The provisions of section 163 shall be applicable to board members appointed from private life.

"SEC. 192. TEMPORARY OPERATING LICENSE. —

Temporary licensing authority. 42 U.S.C. sec. 2242.

"a. In any proceeding upon an application for an operating license for a nuclear power reactor, in which a hearing is otherwise required pursuant to section 189 a., the applicant may petition the Commission for a temporary operating license authorizing operation of the facility pending final action by the Commission on the application. Such petition may be filed at any time after filing of: (1) the report of the Advisory Committee on Reactor Safeguards required by subsection 182 b.; (2) the safety

evaluation of the application by the Commission's regulatory staff; and (3) the regulatory staff's final detailed statement on the environmental impact of the facility prepared pursuant to section 102(2) (C) of the National Environmental Policy Act of 1969 (83 Stat. 853) or, in the case of an application for operating license filed on or before September 9, 1971, if the regulatory staff's final detailed statement required under section 102(2) (C) is not completed, the Commission must satisfy the applicable requirements of the National Environmental Policy Act prior to issuing any temporary operating license under this section 192. The petition shall be accompanied by an affidavit or affidavits setting forth the facts upon which the petitioner relies to justify issuance of the temporary operating license. Any party to the proceeding may file affidavits in support of, or opposition to, the petition within fourteen days after the filing of such petition, or within such additional time not to exceed ten days as may be fixed by the Commission. The Commission shall hold a hearing after ten days' notice and publication once in the Federal Register on any such petition and supporting material filed under this section and the decision of the Commission with respect to the issuance of a temporary operating license following such hearing, shall be on the basis of findings on the matters specified in subsection b. of this section. The hearing required by this section and the decision of the Commission on the petition shall be conducted with expedited procedures as the Commission

may by rule, regulation, or order deem appropriate for a full disclosure of material facts on all substantial issues raised in connection with the proposed temporary operating license.

"b. With respect to any petition filed pursuant to subsection a. of this section, the Commission shall issue a temporary operating license upon finding that:

"(1) the provisions of section 185 have been met with respect to the temporary operating license;

"(2) operation of the facility during the period of the temporary operating license in accordance with its terms and conditions will provide adequate protection of the environment during the period of the temporary operating license; and

"(3) operation of the facility in accordance with the terms and conditions of the temporary operating license is essential toward insuring that the power generating capacity of a utility system or power pool is at, or is restored to, the levels required to assure the adequacy and reliability of the power supply, taking into consideration factors which include, but need not be limited to, alternative available sources of supply, historical reserve requirements for the systems involved to function reliably, the possible endangerment to the public health and safety in the event of power shortages, and data from appropriate Federal and State governmental bodies which have official responsibility to assure an adequate and reliable power supply.

The temporary license shall contain such terms and conditions as the Commission may deem necessary, including the duration of the license and any provision for the extension thereof, and the requirement that the licensee not retire or dismantle any of its existing generating capacity on the ground of the availability of the capacity from the facility which is operating under the temporary license. Any decision or other document authorizing the issuance of any temporary license pursuant to this section shall recite with specificity the reasons justifying the issuance. The decision of the Commission with respect to the issuance of a temporary operating license shall be subject to judicial review pursuant to the Act of December 29, 1950, as amended (ch. 1189, 64 Stat. 1129).

"c. The hearing on the application for the final operating license otherwise required pursuant to section 189 a. shall be concluded as promptly as practicable. The Commission shall vacate the temporary operating license if it finds that the applicant is not prosecuting the application for the final operating license with due diligence. Issuance of a temporary operating license pursuant to subsection b. of this section shall be without prejudice to the position of any party to the proceeding in which a hearing is otherwise required pursuant to section 189 a.: and failure to assert any ground for denial or limitation of a temporary operating license shall not bar the assertion of such ground in connection with the issuance of a subsequent final operating license.

"d. The authority under this section shall expire on October 30, 1973.

"CHAPTER 17. JOINT COMMITTEE ON ATOMIC ENERGY

"SEC. 201. MEMBERSHIP.—There is hereby established a Joint Committee on Atomic Energy to be composed of nine Members of the Senate to be appointed by the President of the Senate, and nine Members of the House of Representatives to be appointed by the Speaker of the House of Representatives. In each instance not more than five Members shall be members of the same political party. Membership. 42 U.S.C. sec. 2251.

"SEC. 202. AUTHORITY AND DUTY.— Authority and duty. 42 U.S.C. sec. 2252.

"a. The Joint Committee shall make continuing studies of the activities of the Atomic Energy Commission and of problems relating to the development, use, and control of atomic energy. During the first ninety days of each session of the Congress, the Joint Committee may conduct hearings in either open or executive session for the purpose of receiving information concerning the development, growth, and state of the atomic energy industry. The Commission shall keep the Joint Committee fully and currently informed with respect to all of the Commission's activities. The Department of Defense shall keep the Joint Committee fully and currently informed with respect to all matters within the Department of Defense relating to the development, utilization, or application of atomic energy. Any Government agency shall Joint Committee on Atomic Energy hearings.

furnish any information requested by the Joint Committee with respect to the activities or responsibilities of that agency in the field of atomic energy. All bills, resolutions, and other matters in the Senate or the House of Representatives relating primarily to the Commission or to the development, use, or control of atomic energy shall be referred to the Joint Committee. The members of the Joint Committee who are Members of the Senate shall from time to time report to the Senate, and the members of the Joint Committee who are Members of the House of Representatives shall from time to time report to the House, by bill or otherwise, their recommendations with respect to matters within the jurisdiction of their respective Houses which are referred to the Joint Committee or otherwise within the jurisdiction of the Joint Committee.

"b. The members of the Joint Committee who are Members of the Senate and the members of the Joint Committee who are Members of the House of Representatives shall, on or before June 30 of each year, report to their respective Houses on the development, use, and control of nuclear energy for the common defenses and security and for peaceful purposes. Each report shall provide facts and information available to the Joint Committee concerning nuclear energy which will assist the appropriate committees of the Congress and individual members in the exercise of informed judgment on matters of weaponry; foreign policy; defense; international trade; and in respect to the expenditure and

appropriation of Government revenues. Each report shall be presented formally under circumstances which provide for clarification and discussion by the Senate and the House of Representatives. In recognition of the need for public understanding, presentations of the reports shall be made to the maximum extent possible in open session and by means of unclassified written materials.

"SEC. 203. CHAIRMAN. — Vacancies in the membership of the Joint Committee shall not affect the power of the remaining members to execute the functions of the Joint Committee, and shall be filled in the same manner as in the case of the original selection. The Joint Committee shall select a Chairman and a Vice Chairman from among its members at the beginning of each Congress. The Vice Chairman shall act in the place and stead of the Chairman in the absence of the Chairman. The Chairmanship shall alternate between the Senate and the House of Representatives with each Congress, and the Chairman shall be selected by the Members from that House entitled to the Chairmanship. The Vice Chairman shall be chosen from the House other than that of the Chairman by the Members from that House.

Chairman. 42 U.S.C. sec. 2253.

"SEC. 204. POWERS. — In carrying out its duties under this Act, the Joint Committee, or any duly authorized subcommittee thereof, is authorized to hold such hearings or investigations, to sit and act at such places and times, to require, by subpena or otherwise, the attend-

Powers. 42 U.S.C. sec. 2254.

ance of such witnesses and the production of such books, papers, and documents, to administer such oaths, to take such testimony, to procure such printing and binding, and to make such expenditures as it deems advisable. The Joint Committee may make such rules respecting its organization and procedures as it deems necessary: *Provided, however,* That no measure or recommendation shall be reported from the Joint Committee unless a majority of the committee assent. Subpenas may be issued over the signature of the Chairman of the Joint Committee or by any member designated by him or by the Joint Committee, and may be served by such person or persons as may be designated by such Chairman or member. The Chairman of the Joint Committee or any member thereof may administer oaths to witnesses.

Committee seal. 2 U.S.C. 192-194.

The Joint Committee may use a committee seal. The provisions of sections 102 to 104, inclusive, of the Revised Statutes, as amended, shall apply in case of any failure of any witness to comply with a subpena or to testify when summoned under authority of this section. The expenses of the Joint Committee shall be paid from the contingent fund of the Senate from funds appropriated for the Joint Committee upon vouchers approved by the Chairman. The cost of stenographic service to report public hearings shall not be in excess of the amounts prescribed by law for reporting the hearings of standing committees of the Senate. The cost of stenographic service to report executive hearings shall be fixed at an equitable rate by the

Joint Committee. Members of the Joint Committee, and its employees and consultants, while traveling on official business for the Joint Committee, may receive either the per diem allowance authorized to be paid to Members of Congress or its employees, or their actual and necessary expenses provided an itemized statement of such expenses is attached to the voucher.

Staff and assistance. 42 U.S.C. sec. 2255.

"SEC. 205. STAFF AND ASSISTANCE. — The Joint Committee is empowered to appoint and fix the compensation of such experts, consultants, technicians, and staff employees as it deems necessary and advisable. The Joint Committee is authorized to utilize the services, information, facilities, and personnel of the departments and establishments of the Government. The Joint Committee is authorized to permit such of its members, employees, and consultants as it deems necessary in the interest of common defense and security to carry firearms while in the discharge of their official duties for the committee.

Classification of information. 42 U.S.C. sec. 2256.

"SEC. 206. CLASSIFICATION OF INFORMATION. — The Joint Committee may classify information originating within the committee in accordance with standards used generally by the executive branch for classifying Restricted Data or defense information.

Records. 42 U.S.C. sec. 2257.

"SEC. 207. RECORDS. — The Joint Committee shall keep a complete record of all committee actions, including a record of the votes on any

question on which a record vote is demanded. All committee records, data, charts and files shall be the property of the Joint Committee and shall be kept in the offices of the Joint Committee or other places as the Joint Committee may direct under such security safeguards as the Joint Committee shall determine in the interest of the common defense and security.

"CHAPTER 19. MISCELLANEOUS

Report to Congress. 42 U.S.C. sec. 2016.

"SEC. 251. REPORT TO CONGRESS. — The Commission shall submit to the Congress, in January of each year, a report concerning the activities of the Commission. The Commission shall include in such report, and shall at such other times as it deems desirable submit to the Congress, such recommendations for additional legislation as the Commission deems necessary or desirable.

Energy Reorganization Act of 1974

AN ACT

To reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration and in a new Nuclear Regulatory Commission in order to promote more efficient management of such functions.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

Energy Reorganization Act of 1974.

SECTION 1. This Act may be cited as the "Energy Reorganization Act of 1974". 42 U.S.C. 5801 note.

DECLARATION OF PURPOSE

SEC. 2. (a) The Congress hereby declares that the general welfare and the common defense and security require effective action to develop, and increase the efficiency and reliability of use of, all energy sources to meet the needs of present and future generations, to increase the productivity of the national economy and strengthen its position in regard to international trade, to make the Nation self-sufficient in energy, to advance the goals of restoring, protecting, and enhancing environmental quality, and to assure public health and safety. 42 U.S.C. 5801.

Energy Research and Development Administration, establishment.

(b) The Congress finds that, to best achieve these objectives, improve Government operations, and assure the coordinated and effective development of all energy sources, it is necessary to establish an Energy Research and Development Administration to bring together and direct Federal activities relating to research and development on the various sources of energy, to increase the efficiency and reliability in the use of energy, and to carry out the performance of other functions, including but not limited to the Atomic Energy Commission's military and production activities and its general basic research activities. In establishing an Energy Research and Development Administration to achieve these objectives, the Congress intends that all possible sources of energy be developed consistent with warranted priorities.

88 Stat. 1233.
88 Stat. 1234.

Separation of AEC licensing and regulatory functions.

(c) The Congress finds that it is in the public interest that the licensing and related regulatory functions of the Atomic Energy Commission be separated from the performance of the other functions of the Commission, and that this separation be effected in an orderly manner, pursuant to this Act, assuring adequacy of technical and other resources necessary for the performance of each.

Small business participation.

(d) The Congress declares that it is in the public interest and the policy of Congress that small business concerns be given a reasonable opportunity to participate, insofar as is possible, fairly and equitably in grants, contracts, purchases, and other Federal activities relating

to research, development, and demonstration of sources of energy efficiency, and utilization and conservation of energy. In carrying out this policy, to the extent practicable, the Administrator shall consult with the Administrator of the Small Business Administration.

Priorities.

(e) Determination of priorities which are warranted should be based on such considerations as power-related values of an energy source, preservation of material resources, reduction of pollutants, export market potential (including reduction of imports), among others. On such a basis, energy sources warranting priority might include, but not be limited to, the various methods of utilizing solar energy.

TITLE I — ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

ESTABLISHMENT

42 U.S.C. 5811.

SEC. 101. There is hereby established an independent executive agency to be known as the Energy Research and Development Administration (hereinafter in this Act referred to as the "Administration").

OFFICERS

Administrator.
42 U.S.C. 5812.

SEC. 102. (a) There shall be at the head of the Administration an Administrator of Energy Research and Development (hereinafter in this Act referred to as the "Administrator"), who shall be appointed from civilian life by the President by and with the advice and consent

of the Senate. A person may not be appointed as Administrator within two years after release from active duty as a commissioned officer of a regular component of an Armed Force. The Administration shall be administered under the supervision and direction of the Administrator, who shall be responsible for the efficient and coordinated management of the Administration.

Deputy Administrator.

(b) There shall be in the Administration a Deputy Administrator, who shall be appointed by the President, by and with the advice and consent of the Senate.

88 Stat. 1234. 88 Stat. 1235.

(c) The President shall appoint the Administrator and Deputy Administrator from among individuals who, by reason of their general background and experience are specially qualified to manage a full range of energy research and development programs.

Assistant Administrators.

(d) There shall be in the Administration six Assistant Administrators, one of whom shall be responsible for fossil energy, another for nuclear energy, another for environment and safety, another for conservation, another for solar, geothermal, and advanced energy systems, and another for national security. The Assistant Administrators shall be appointed by the President, by and with the advice and consent of the Senate. The President shall appoint each Assistant Administrator from among individuals who, by reason of general background and experience, are specially qualified to manage the energy technology area assigned to such Assistant Administrator.

General Counsel.

(e) There shall be in the Administration a General Counsel who shall be appointed by the Administrator and who shall serve at the pleasure of and be removable by the Administrator.

Additional officers.

(f) There shall be in the Administration not more than eight additional officers appointed by the Administrator. The positions of such officers shall be considered career positions and be subject to subsection 161 d. of the Atomic Energy Act.

Director of Military Application.

(g) The Division of Military Application transferred to and established in the Administration by section 104 (d) of this Act shall be under the direction of a Director of Military Application, who shall be appointed by the Administrator and who shall serve at the pleasure of and be removable by the Administrator and shall be an active commissioned officer of the Armed Forces serving in general or flag officer rank or grade. The functions, qualifications, and compensation of the Director of Military Application shall be the same as those provided under the Atomic Energy Act of 1954, as amended, for the Assistant General Manager for Military Application.

42 U.S.C. 2011 note.

International cooperation.

(h) Officers appointed pursuant to this section shall perform such functions as the Administrator shall specify from time to time. The Administrator shall delegate to one such officer the special responsibility for international cooperation in all energy and related environmental research and development.

Order of succession.

(i) The Deputy Administrator (or in the absence or disability of the Deputy Administra-

tor, or in the event of a vacancy in the office of the Deputy Administrator, an Assistant Administrator, the General Counsel or such other official, determined according to such order as the Administrator shall prescribe) shall act for and perform the functions of the Administrator during any absence or disability of the Administrator or in the event of a vacancy in the office of the Administrator.

RESPONSIBILITIES OF THE ADMINISTRATOR

42 U.S.C. 5813.

SEC. 103. The responsibilities of the Administrator shall include, but not be limited to —

88 Stat. 1235.
88 Stat. 1236.

(1) exercising central responsibility for policy planning, coordination, support, and management of research and development programs respecting all energy sources, including assessing the requirements for research and development in regard to various energy sources in relation to near-term and long-range needs, policy planning in regard to meeting those requirements, undertaking programs for the optimal development of the various forms of energy sources, managing such programs, and disseminating information resulting therefrom:

(2) encouraging and conducting research and development, including demonstration of commercial feasibility and practical applications of the extraction, conversion, storage, transmission, and utilization phases related to the development and use of energy from fossil, nuclear, solar, geothermal, and other energy sources;

(3) engaging in and supporting environmental, biomedical, physical, and safety research related to the development of energy sources and utilization technologies;

(4) taking into account the existence, progress, and results of other public and private research and development activities, including those activities of the Federal Energy Administration relating to the development of energy resources using currently available technology in promoting increased utilization of energy resources, relevant to the Administration's mission in formulating its own research and development programs;

(5) participating in and supporting cooperative research and development projects which may involve contributions by public or private persons or agencies, of financial or other resources to the performance of the work;

(6) developing, collecting, distributing, and making available for distribution, scientific and technical information concerning the manufacture or development of energy and its efficient extraction, conversion, transmission, and utilization;

(7) creating and encouraging the development of general information to the public on all energy conservation technologies and energy sources as they become available for general use, and the Administrator, in conjunction with the Administrator of the Federal Energy Administration shall, to the extent practicable, disseminate such information through the use of mass communications;

(8) encouraging and conducting research and development in energy conservation, which shall be directed toward the goals of reducing total energy consumption to the maximum extent practicable, and toward maximum possible improvement in the efficiency of energy use. Development of new and improved conservation measures shall be conducted with the goal of the most expeditious possible application of these measures;

(9) encouraging and participating in international cooperation in energy and related environmental research and development;

88 Stat. 1236.
88 Stat. 1237.

(10) helping to assure an adequate supply of manpower for the accomplishment of energy research and development programs, by sponsoring and assisting in education and training activities in institutions of higher education, vocational schools, and other institutions, and by assuring the collection, analysis, and dissemination of necessary manpower supply and demand data;

(11) encouraging and conducting research and development in clean and renewable energy sources.

ABOLITION AND TRANSFERS

Atomic Energy Commission.
42 U.S.C. 5814.

SEC. 104. (a) The Atomic Energy Commission is hereby abolished. Sections 21 and 22 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2031 and 2032) are repealed.

(b) All other functions of the Commission, the Chairman and members of the Commission,

and the officers and components of the Commission are hereby transferred or allowed to lapse pursuant to the provisions of this Act.

(c) There are hereby transferred to and vested in the Administrator all functions of the Atomic Energy Commission, the Chairman and members of the Commission, and the officers and components of the Commission, except as otherwise provided in this Act.

(d) The General Advisory Committee established pursuant to section 26 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2036), the Patent Compensation Board established pursuant to section 157 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2187) and the Divisions of Military Application and Naval Research established pursuant to section 25 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2035), are transferred to the Energy Research and Development Administration and the functions of the Commission with respect thereto, and with respect to relations with the Military Liaison Committee established by section 27 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2037), are transferred to the Administrator.

Interior Department functions.

(e) There are hereby transferred to and vested in the Administrator such functions of the Secretary of the Interior, the Department of the Interior, and officers and components of such department —

(1) as relate to or are utilized by the Office of Cost Research established pursuant to the

Act of June 1, 1960 (74 Stat. 336; 30 U.S.C. 661-668);

(2) as relate to or are utilized in connection with fossil fuel energy research and development programs and related activities conducted by the Bureau of Mines "energy centers" and synthane plant to provide greater efficiency in the extraction, processing and utilization of energy resources for the purpose of conserving those resources, developing alternative energy resources such as oil and gas secondary and tertiary recovery, oil, shale and synthetic fuels, in proving methods of managing energy-related waste and pollutants, and providing technical guidance needed to establish and administer national energy policies; and

(3) as relate to or are utilized for underground electric power transmission research.

88 Stat. 1238. Helium applications study.

The Administrator shall conduct a study of the potential energy applications of helium and, within six months from the date of the enactment of this Act, report to the President and Congress his recommendations concerning the management of the Federal helium programs, as they relate to energy.

88 Stat. 1238. Report to President and Congress.

National Science Foundation functions.

(f) There are hereby transferred to and vested in the Administrator such functions of the National Science Foundation as relate to or are utilized in connection with —

(1) solar heating and cooling development; and

(2) geothermal power development.

Environmental Protection Agency functions.

(g) There are hereby transferred to and vested in the Administrator such functions of the Environmental Protection Agency and the officers and components thereof as relate to or are utilized in connection with research, development, and demonstration, but not assessment of monitoring for regulatory purposes, of alternative automotive power systems.

(h) To the extent necessary or appropriate to perform functions and carry out programs transferred by this Act, the Administrator and Commissions may exercise, in relation to the functions so transferred, any authority or part thereof available by law, including appropriation Acts, to the official or agency from which such functions were transferred.

Use of other agencies' capabilities.

(i) In the exercise of his responsibilities under section 103, the Administrator shall utilize, with their consent, to the fullest extent he determines advisable the technical and management capabilities of other executive agencies having facilities, personnel, or other resources which can assist or advantageously be expanded to assist in carrying out such responsibilities. The Administrator shall consult with the head of each agency with respect to such facilities, personnel, or other resources, and may assign, with their consent, specific programs or projects in energy research and development as appropriate. In making such assignments under this subsection, the head of each such agency shall insure that —

(1) such assignments shall be in addition to and not detract from the basic mission responsibilities of the agency, and

(2) such assignments shall be carried out under such guidance as the Administrator deems appropriate.

ADMINISTRATIVE PROVISIONS

Regulations. 42 U.S.C. 5815.

SEC. 105. (a) The Administrator is authorized to prescribe such policies, standards, criteria, procedures, rules, and regulations as he may deem to be necessary or appropriate to perform functions now or hereafter vested in him.

Policy planning and evaluation.

(b) The Administrator shall engage in such policy planning, and perform such program evaluation analyses and other studies, as may be necessary to promote the efficient and coordinated administration of the Administration and properly assess progress toward the achievement of its missions.

Delegation of functions.

(c) Except as otherwise expressly provided by law, the Administrator may delegate any of his functions to such officers and employees of the Administration as he may designate, and may authorize such successive redelegations of such functions as he may deem to be necessary or appropriate.

Organization.

(d) Except as provided in section 102 and in section 104(d), the Administrator may organize the Administration as he may deem to be necessary or appropriate.

Field offices.

(e) The Administrator is authorized to establish, maintain, alter, or discontinue such State, regional, district, local, or other field offices as he may deem to be necessary or appropriate to perform functions now or hereafter vested in him.

88 Stat. 1239. Seal.

(f) The Administrator shall cause a seal of office to be made for the Administration of such device as he shall approve, and judicial notice shall be taken of such seal.

Working capital fund.

(g) The Administrator is authorized to establish a working capital fund, to be available without fiscal year limitation, for expenses necessary for the maintenance and operation of such common administrative services he shall find to be desirable in the interests of economy and efficiency. There shall be transferred to the fund the stocks of supplies, equipment, assets other than real property, liabilities, and unpaid obligations relating to the services which he determines will be performed through the fund. Appropriations to the fund, in such amounts as may be necessary to provide additional working capital are authorized. The working capital fund shall recover from the appropriations and funds for which services are performed, either in advance or by way of reimbursement, amounts which will approximate the costs incurred including the accrual of annual leave and the depreciation of equipment. The fund shall also be credited with receipts from the sale or exchange of its property, and receipts in payment for loss or damage to property owned by the fund.

Information from other agencies.

(h) Each department, agency, and instrumentality of the executive branch of the Government is authorized to furnish to the Administrator, upon his request, any information or other data which the Administrator deems necessary to carry out his duties under this title.

PERSONNEL AND SERVICES

Appointment and pay.
42 U.S.C. 5816

SEC. 106. (a) The Administrator is authorized to select, appoint, employ, and fix the compensation of such officers and employees, including attorneys, pursuant to section 161 d. of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2201(d)) as are necessary to perform the functions now or hereafter vested in him and to prescribe their functions.

Experts and consultants.

(b) The Administrator is authorized to obtain services as provided by section 3109 of title 5 of the United States Code.

Military personnel.

(c) The Administrator is authorized to provide for participation of military personnel in the performance of his functions. Members of the Army, the Navy, the Air Force, or the Marine Corps may be detailed for service in the Administration by the appropriate military Secretary, pursuant to cooperative agreements with the Secretary, for service in the Administration in positions other than a position the occupant of which must be approved by and with the advice and consent of the Senate.

(d) Appointment, detail, or assignment to, acceptance of, and service in, any appointive or other position in the Administration under this

section shall in no way alter the status, office, rank, or grade which such officers or enlisted men may occupy or hold, or any emolument, prerequisite, right, privilege, or benefit incident to or arising out of any such status, office, rank, or grade. A member so appointed, detailed, or assigned shall not be subject to direction or control by his Armed Force, or any officer thereof, directly or indirectly, with respect to the responsibilities exercised in the position to which appointed, detailed, or assigned.

Transportation and per diem.

(e) The Administrator is authorized to pay transportation expenses, and per diem in lieu of subsistence expenses, in accordance with chapter 57 of title 5 of the United States Code for travel between places of recruitment and duty, and while at places of duty, of persons appointed for emergency, temporary, or seasonal services in the field service of the Administration.

88 Stat. 1240. Personnel of other agencies.

(f) The Administrator is authorized to utilize, on a reimbursable basis, the services of any personnel made available by any department, agency, or instrumentality, including any independent agency of the Government.

Advisory boards.
5 U.S.C. app. I.

(g) The Administrator is authorized to establish advisory boards, in accordance with the provisions of the Federal Advisory Committee Act (Public Law 92-463), to advise with and make recommendations to the Administrator on legislation, policies, administration, research, and other matters.

Noncitizens.

(h) The Administrator is authorized to employ persons who are not citizens of the United

States in expert, scientific, technical, or professional capacities whenever he deems it in the public interest.

POWERS

Research and development.

42 U.S.C. 5817

SEC. 107. (a) The Administrator is authorized to exercise his powers in such manner as to insure the continued conduct of research and development and related activities in areas or fields deemed by the Administrator to be pertinent to the acquisition of an expanded fund of scientific, technical, and practical knowledge in energy matters. To this end, the Administrator is authorized to make arrangements (including contracts, agreements, and loans) for the conduct of research and development activities with private or public institutions or persons, including participation in joint or cooperative projects of a research, developmental, or experimental nature; to make payments (in lump sum or installments, and in advance or by way of reimbursement, with necessary adjustments on account of overpayments or underpayments); and generally to take such steps as he may deem necessary or appropriate to perform functions now or hereafter vested in him. Such functions of the Administrator under this Act as are applicable to the nuclear activities transferred pursuant to this title shall be subject to the provisions of the Atomic Energy Act of 1954, as amended, and to other authority applicable to such nuclear activities. The non-nuclear responsibilities and functions of the Administrator referred to in sections 103 and 104 of this

Contracts, etc.

42 U.S.C. 2011 note.

Act shall be carried out pursuant to the provisions of this Act, applicable authority existing immediately before the effective date of this Act, or in accordance with the provisions of chapter 4 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2051-2053).

Facilities and real property.
40 U.S.C. 601 note.
5 U.S.C. app. II.

(b) Except for public buildings as defined in the Public Buildings Act of 1959, as amended, and with respect to leased space subject to the provisions of Reorganization Plan Numbered 18 of 1950, the Administrator is authorized to acquire (by purchase, lease, condemnation, or otherwise), construct, improve, repair, operate, and maintain facilities and real property as the Administrator deems to be necessary in and outside of the District of Columbia. Such authority shall apply only to facilities required for the maintenance and operation of laboratories, research and testing sites and facilities, quarters, and related accommodations for employees and dependents of employees of the Administration, and such other special-purpose real property as the Administrator deems to be necessary in and outside the District of Columbia. Title to any property or interest therein, real, personal, or mixed, acquired pursuant to this section, shall be in the United States.

Services for employees at remote locations.

(c)(1) The Administrator is authorized to provide, construct, or maintain, as necessary and when not otherwise available, the following for employees and their dependents stationed at remote locations:

(A) Emergency medical services and supplies.

(B) Food and other subsistence supplies.

88 Stat. 1241.

(C) Messing facilities.

(D) Audiovisual equipment, accessories, and supplies for recreation and training.

(E) Reimbursement for food, clothing, medicine, and other supplies furnished by such employees in emergencies for the temporary relief of distressed persons.

(F) Living and working quarters and facilities.

(G) Transportation for school-age dependents of employees to the nearest appropriate educational facilities.

(2) The furnishing of medical treatment under sub-paragraph (A) of paragraph (1) and the furnishing of services and supplies under paragraphs (B) and (C) of paragraph (1) shall be at prices reflecting reasonable value as determined by the Administrator.

(3) Proceeds from reimbursements under this section shall be deposited in the Treasury and may be withdrawn by the Administrator to pay directly the cost of such work or services, to repay or make advances to appropriations or funds which do or will bear all or a part of such cost, or to refund excess sums when necessary; except that such payments may be credited to a service or working capital fund otherwise established by law, and used under the law governing such funds, if the fund is available for use by the Administrator for performing the work or services for which payment is received.

Acquisition of copyrights, patents, etc.

(d) The Administrator is authorized to acquire any of the following described rights if the property acquired thereby is for use in, or is

useful to, the performance of functions vested in him:

(1) Copyrights, patents, and applications for patents, designs, processes, specifications, and data.

(2) Licenses under copyrights, patents, and applications for patents.

(3) Releases, before suit is brought, for past infringement of patents or copyrights.

Dissemination of information.

(e) Subject to the provisions of chapter 12 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2161-2166), and other applicable law, the Administrator shall disseminate scientific, technical, and practical information acquired pursuant to this title through information programs and other appropriate means, and shall encourage the dissemination of scientific, technical, and practical information relating to energy so as to enlarge the fund of such information and to provide that free interchange of ideas and criticism which is essential to scientific and industrial progress and public understanding.

Gifts and bequests.

(f) The Administrator is authorized to accept, hold, administer, and utilize gifts, and bequests of property, both real and personal, for the purpose of aiding or facilitating the work of the Administration. Gifts and bequests of money and proceeds from sales of other property received as gifts or bequests shall be deposited in the Treasury and shall be disbursed upon the order of the Administrator. For the purposes of Federal income, estate, and gift taxes, property accepted under this section shall be considered as a gift or bequest to the United States.

INTERIM COORDINATION

Energy Resources Council, establishment. 42 U.S.C. 5818.

SEC. 108. (a) There is established in the Executive Office of the President an Energy Resources Council. The Council shall be composed of the Secretary of the Interior, the Administrator of the Federal Energy Administration, the Administrator of the Energy Research and Development Administration, the Secretary of State, the Director, Office of Management and Budget, and such other officials of the Federal Government as the President may designate. The President shall designate one of the members of the Council to serve as Chairman.

88 Stat. 1242.

(b) It shall be the duty and function of the Council to —

(1) insure communication and coordination among the agencies of the Federal Government which have responsibilities for the development and implementation of energy policy or for the management of energy resources:

(2) make recommendations to the President and to the Congress for measures to improve the implementation of Federal energy policies or the management of energy resources with particular emphasis upon policies and activities involving two or more Departments or independent agencies; and

(3) advise the President in the preparation of the reorganization recommendations required by section 110 of this Act.

Testimony before Congress.

(c) The Chairman of the Council may not refuse to testify before the Congress or any duly

authorized committee thereof regarding the duties of the Council or other matters concerning interagency coordination of energy policy and activities.

Effective date. Publication in Federal Register.

(d) This section shall be effective no later than sixty days after the enactment of this Act or such earlier date as the President shall prescribe and publish in the Federal Register, and shall terminate upon enactment of a permanent department responsible for energy and natural resources or two years after such effective date, whichever shall occur first.

FUTURE REORGANIZATION

Report to Congress. 42 U.S.C. 5819.

SEC. 109. (a) The President shall transmit to the Congress as promptly as possible, but not later than June 30, 1975, such additional recommendations as he deems advisable for organization of energy and related functions in the Federal Government, including, but not limited to, whether or not there shall be established (1) a Department of Energy and Natural Resources, (2) an Energy Policy Council, and (3) a consolidation in whole or in part of regulatory functions concerning energy.

(b) This report shall replace and serve the purposes of the report required by section 15(a) (4) of the Federal Energy Administration Act.

Ante, p. 109.

COORDINATION WITH ENVIRONMENTAL EFFORTS

42 U.S.C. 5820.

SEC. 110. The Administrator is authorized to establish programs to utilize research and development performed by other Federal agen-

cies to minimize the adverse environmental effects of energy projects. The Administrator of the Environmental Protection Agency, as well as other affected agencies and departments, shall cooperate fully with the Administrator in establishing and maintaining such programs, and in establishing appropriate inter-agency agreements to develop cooperative programs and to avoid unnecessary duplication.

TITLE II — NUCLEAR REGULATORY COMMISSION

ESTABLISHMENT AND TRANSFERS

Members and Chairman. 42 U.S.C. 5841.

SEC. 201. (a) There is established an independent regulatory commission to be known as the Nuclear Regulatory Commission which shall be composed of five members, each of whom shall be a citizen of the United States. The

88 Stat. 1243.

President shall designate one member of the Commission as Chairman thereof to serve as such during the pleasure of the President. The Chairman may from time to time designate any other member of the Commission as Acting Chairman to act in the place and stead of the Chairman during his absence. The Chairman (or the Acting Chairman in the absence of the Chairman) shall preside at all meetings of the Commission and a quorum for the transaction of business shall consist of at least three members present. Each member of the Commission, including the Chairman, shall have equal responsibility and authority in all decisions and actions of the Commission, shall have full access to all information relating to the performance of his duties or responsibilities, and shall have one vote. Action of the Commission shall be determined by a majority vote of the members present. The Chairman (or Acting Chairman in the absence of the Chairman) shall be the official spokesman of the Commission in its relations with the Congress, Government agencies, persons, or the public, and, on behalf of the Commission, shall see to the faithful execution of the policies and decisions of the Commission, and shall report thereon to the Commission from time to time or as the Commission may direct. The Commission shall have an official seal which shall be judicially noticed.

Seal.

(b)(1) Members of the Commission shall be appointed by the President, by and with the advice and consent of the Senate.

(2) Appointments of members pursuant to this sub-section shall be made in such a manner that not more than three members of the Commission shall be members of the same political party.

(c) Each member shall serve for a term of five years, each such term to commence on July 1, except that of the five members first appointed to the Commission, one shall serve for one year, one for two years, one for three years, one for four years, and one for five years, to be designated by the President at the time of appointment.

Submission of appointments to Senate.

(d) Such initial appointments shall be submitted to the Senate within sixty days of the

signing of this Act. Any individual who is serving as a member of the Atomic Energy Commission at the time of the enactment of this Act, and who may be appointed by the President to the Commission, shall be appointed for a term designated by the President, but which term shall terminate not later than the end of his present term as a member of the Atomic Energy Commission, without regard to the requirements of subsection (b)(2) of this section. Any subsequent appointment of such individuals shall be subject to the provisions of this section.

(e) Any member of the Commission may be removed by the President for inefficiency, neglect of duty, or malfeasance in office. No member of the Commission shall engage in any business, vocation, or employment other than that of serving as a member of the Commission.

Transfer of AEC functions and personnel.

(f) There are hereby transferred to the Commission all the licensing and related regulatory functions of the Atomic Energy Commission, the Chairman and members of the Commission, the General Counsel, and other officers and components of the Commission — which functions, officers, components, and personnel are excepted from the transfer to the Administrator by section 104(c) of this Act.

Additional transfers.

(g) In addition to other functions and personnel transferred to the Commission, there are also transferred to the Commission —

(1) the functions of the Atomic Safety and Licensing Board Panel and the Atomic Safety and Licensing Appeal Board;

(2) such personnel as the Director of the Office of Management and Budget determines are necessary for exercising responsibilities under section 205, relating to, research, for the purpose of confirmatory assessment relating to licensing and other regulation under the provisions of the Atomic Energy Act of 1954, as amended, and of this Act. 88 Stat. 1244. 42 U.S.C. 2011 note.

LICENSING AND RELATED REGULATORY FUNCTIONS RESPECTING SELECTED ADMINISTRATION FACILITIES

SEC. 202. Notwithstanding the exclusions provided for in section 110 a. or any other provisions of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2140(a)), the Nuclear Regulatory Commission shall, except as otherwise specifically provided by section 110 b. of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2140(b)), or other law, have licensing and related regulatory authority pursuant to chapters 6, 7, 8, and 10 of the Atomic Energy Act of 1954, as amended, as to the following facilities of the Administration: 42 U.S.C. 5842. 42 U.S.C. 2071-2112, 2131-2140.

(1) Demonstration Liquid Metal Fast Breeder reactors when operated as part of the power generation facilities of an electric utility system, or when operated in any other manner for the purpose of demonstrating the suitability for commercial application of such a reactor.

(2) Other demonstration nuclear reactors — except those in existence on the effective date of this Act — when operated as part of the power generation facilities of an electric utility system, or when operated in any other manner for

the purpose of demonstrating the suitability for commercial application of such a reactor.

(3) Facilities used primarily for the receipt and storage of high-level radioactive wastes resulting from activities licensed under such Act.

(4) Retrievable Surface Storage Facilities and other facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the Administration, which are not used for, or are part of, research and development activities.

OFFICE OF NUCLEAR REACTOR REGULATION

Establishment. 42 U.S.C. 5843. Director.

SEC. 203. (a) There is hereby established in the Commission an Office of Nuclear Reactor Regulation under the direction of a Director of Nuclear Reactor Regulation, who shall be appointed by the Commission, who may report directly to the Commission, as provided in section 209, and who shall serve at the pleasure of and be removable by the Commission.

Functions.

(b) Subject to the provisions of this Act, the Director of Nuclear Reactor Regulation shall perform such functions as the Commission shall delegate including:

42 U.S.C. 2011 note.

(1) Principal licensing and regulation involving all facilities, and materials licensed under the Atomic Energy Act of 1954, as amended, associated with the construction and operation of nuclear reactors licensed under the Atomic Energy Act of 1954, as amended;

(2) Review the safety and safeguards of all such facilities, materials, and activities, and

such review functions shall include, but not be limited to—

(A) monitoring, testing and recommending upgrading of systems designed to prevent substantial health or safety hazards; and 88 Stat. 1245.

(B) evaluating methods of transporting special nuclear and other nuclear materials and of transporting and storing high-level radioactive wastes to prevent radiation hazards to employees and the general public.

(3) Recommend research necessary for the discharge of the functions of the Commission.

(c) Nothing in this section shall be construed to limit in any way the functions of the Administration relating to the safe operation of all facilities resulting from all activities within the jurisdiction of the Administration pursuant to this Act.

OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

Establishment. 42 U.S.C. 5844. Director.

SEC. 204. (a) There is hereby established in the Commission an Office of Nuclear Material Safety and Safeguards under the direction of a Director of Nuclear Material Safety and Safeguards, who shall be appointed by the Commission, who may report directly to the Commission as provided in section 209, and who shall serve at the pleasure of and be removable by the Commission.

Functions.

(b) Subject to the provisions of this Act, the Director of Nuclear Material Safety and Safeguards shall perform such functions as the Commission shall delegate, including:

42 U.S.C. 2011 note.

(1) Principal licensing and regulation involving all facilities and materials, licensed under the Atomic Energy Act of 1954, as amended, associated with the processing, transport, and handling of nuclear materials, including the provision and maintenance of safeguards against threats, thefts, and sabotage of such licensed facilities, and materials.

(2) Review safety and safeguards of all such facilities and materials licensed under the Atomic Energy Act of 1954, as amended, and such review shall include, but not be limited to—

(A) monitoring, testing, and recommending upgrading of internal accounting systems for special nuclear and other nuclear materials licensed under the Atomic Energy Act of 1954, as amended;

(B) developing, in consultation and coordination with the Administration, contingency plans for dealing with threats, thefts, and sabotage relating to special nuclear materials, high-level radioactive wastes and nuclear facilities resulting from all activities licensed under the Atomic Energy Act of 1954, as amended;

(C) assessing the need for, and the feasibility of, establishing a security agency within the office for the performance of the safeguards functions, and a report with recommendations on this matter shall be prepared within one year of the effective date of this Act and promptly transmitted to the Congress by the Commission.

Report to Congress.

(3) Recommending research to enable the Commission to more effectively perform its functions.

(c) Nothing in this section shall be construed to limit in any way the functions of the Administration relating to the safeguarding of special nuclear materials, high-level radioactive wastes and nuclear facilities resulting from all activities within the jurisdiction of the Administration pursuant to this Act.

88 Stat. 1246.

OFFICE OF NUCLEAR REGULATORY RESEARCH

SEC. 205. (a) There is hereby established in the Commission and Office of Nuclear Regulatory Research under the direction of a Director of Nuclear Regulatory Research, who shall be appointed by the Commission, who may report directly to the Commission as provided in section 209, and who shall serve at the pleasure of and be removable by the Commission.

Establishment. 42 U.S.C. 5845.

Director.

(b) Subject to the provisions of this Act, the Director of Nuclear Regulatory Research shall perform such functions as the Commission shall delegate including:

Functions.

(1) Developing recommendations for research deemed necessary for performance by the Commission of its licensing and related regulatory functions.

(2) Engaging in or contracting for research which the Commission deems necessary for the performance of its licensing and related regulatory functions.

(c) The Administrator of the Administration and the head of every other Federal agency shall —

Cooperation of Federal agencies.

(1) cooperate with respect to the establishment of priorities for the furnishing of such research services as requested by the Commission for the conduct of its functions;

(2) furnish to the Commission, on a reimbursable basis, through their own facilities or by contract or other arrangement, such research services as the Commission deems necessary and requests for the performance of its functions; and

(3) consult and cooperate with the Commission on research and development matters of mutual interest and provide such information and physical access to its facilities as will assist the Commission in acquiring the expertise necessary to perform its licensing and related regulatory functions.

(d) Nothing in subsections (a) and (b) of this section or section 201 of this Act shall be construed to limit in any way the functions of the Administration relating to the safety of activities within the jurisdiction of the Administration.

Information and research services.

(e) Each Federal agency, subject to the provisions of existing law, shall cooperate with the Commission and provide such information and research services, on a reimbursable basis, as it may have or be reasonably able to acquire.

NONCOMPLIANCE

42 U.S.C. 5846.

SEC. 206. (a) Any individual director, or responsible officer of a firm constructing, owning, operating, or supplying the components of any

42 U.S.C. 2011 note.

facility or activity which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954 as amended, or pursuant to this Act, who obtains information reasonably indicating that such facility or activity or basic components supplied to such facility or activity —

(1) fails to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order, or license of the Commission relating to substantial safety hazards, or

(2) contains a defect which would create a substantial safety hazard, as defined by regulations which the Commission shall promulgate,

shall immediately notify the Commission of such failure to comply, or of such defect, unless such person has actual knowledge that the Commission has been adequately informed of such defect or failure to comply.

88 Stat. 1247.

Penalty.

(b) Any person who knowingly and consciously fails to provide the notice required by subsection (a) of this section shall be subject to a civil penalty in an amount equal to the amount provided by section 234 of the Atomic Energy Act of 1954, as amended.

42 U.S.C. 2282.

Posting of requirements.

(c) The requirements of this section shall be prominently posted on the premises of any facility licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended.

42 U.S.C. 2011 note.

Enforcement.

(d) The Commission is authorized to conduct such reasonable inspections and other enforcement activities as needed to insure compliance with the provisions of this section.

NUCLEAR ENERGY CENTER SITE SURVEY

42 U.S.C. 5847.

SEC. 207. (a)(1) The Commission is authorized and directed to make or cause to be made under its direction, a national survey, which shall include consideration of each of the existing or future electric reliability regions, or other appropriate regional areas, to locate and identify possible nuclear energy center sites. This survey shall be conducted in cooperation with other interested Federal, State, and local agencies, and the views of interested persons, including electric utilities, citizens' groups, and others, shall be solicited and considered.

Federal-State-local cooperation. Solicitation of views.

Definition.

(2) For purposes of this section, the term "nuclear energy center site" means any site, including a site not restricted to land, large enough to support utility operations or other elements of the total nuclear fuel cycle, or both including, if appropriate, nuclear fuel reproces sing facilities, nuclear fuel fabrication plants, retrievable nuclear waste storage facilities, and uranium enrichment facilities.

(3) The survey shall include —

(a) a regional evaluation of natural resources, including land, air, and water resources, available for use in connection with nuclear energy center sites; estimates of future electric power requirements that can be served by each nuclear energy center site; an assessment of the economic impact of each nuclear energy site; and consideration of any other relevant factors, including but not limited to population distribution, proximity to electric load centers and to other elements of the fuel cycle, transmission

line rights-of-way, and the availability of other fuel resources;

(b) an evaluation of the environmental impact likely to result from construction and operation of such nuclear energy centers, including an evaluation whether such nuclear energy centers will result in greater or lesser environmental impact than separate siting of the reactors and/or fuel cycle facilities; and

(c) consideration of the use of federally owned property and other property designated for public use, but excluding national parks, national forests, national wilderness areas, and national historic monuments.

Report to Congress and Council on Environmental Quality; public availability.

(4) A report of the results of the survey shall be published and transmitted to the Congress and the Council on Environmental Quality not later than one year from the date of the enactment of this Act and shall be made available to the public, and shall be updated from time to time thereafter as the Commission, in its discretion, deems advisable. The report shall include the Commission's evaluation of the results of the survey and any conclusions and recommendations, including recommendations for legislation, which the Commission may have concerning the feasibility and practicality of locating nuclear power reactors and/or other elements of the nuclear fuel cycle or nuclear energy center sites. The Commission is authorized to adopt policies which will encourage the location of nuclear power reactors and related fuel cycle facilities on nuclear energy center sites insofar as practicable.

88 Stat. 1248.

ABNORMAL OCCURRENCE REPORTS

Reports to Congress. 42 U.S.C. 5848.

SEC. 208. The Commission shall submit to the Congress each quarter a report listing for that period any abnormal occurrences at or associated with any facility which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954 as amended, or pursuant to this Act. For the purposes of this section an abnormal occurrence is an unscheduled incident or event which the Commission determines is significant from the standpoint of public health or safety. Nothing in the preceding sentence shall limit the authority of a court to review the determination of the Commission. Each such report shall contain —

42 U.S.C. 2011 note.

(1) the date and place of each occurrence;

(2) the nature and probable consequence of each occurrence;

(3) the cause or causes of each; and

(4) any action taken to prevent reoccurrence;

Public dissemination of information.

the Commission shall also provide as wide dissemination to the public of the information specified in clauses (1) and (2) of this section as reasonably possible within fifteen days of its receiving information of each abnormal occurrence and shall provide as wide dissemination to the public as reasonably possible of the information specified in clauses (3) and (4) as soon as such information becomes available to it.

OTHER OFFICERS

Executive Director. 42 U.S.C. 5849.

SEC. 209. (a) The Commission shall appoint an Executive Director for Operations, who shall

serve at the pleasure of and be removable by the Commission.

Functions.

(b) The Executive Director shall perform such functions as the Commission may direct, except that the Executive Director shall not limit the authority of the director of any component organization provided in this Act to communicate with or report directly to the Commission when such director of a component organization deems it necessary to carry out his responsibilities.

Other officers.

(c) There shall be in the Commission not more than five additional officers appointed by the Commission. The positions of such officers shall be considered career positions and be subject to subsection 161 d. of the Atomic Energy Act.

42 U.S.C. 2201.

TITLE III — MISCELLANEOUS AND TRANSITIONAL PROVISIONS

TRANSITIONAL PROVISIONS

Lapses of agencies and positions. 42 U.S.C. 5871.

SEC. 301. (a) Except as otherwise provided in this Act, whenever all of the functions or programs of an agency, or other body, or any component thereof, affected by this Act, have been transferred from that agency, or other body, or any component thereof by this Act, the agency, or other body, or component thereof shall lapse. If an agency, or other body, or any component thereof, lapses pursuant to the preceding sentence, each position and office therein which was expressly authorized by law, or the incumbent

of which was authorized to receive compensation at the rate prescribed for an office or position at level II, III, IV, or V of the Executive Schedule (5 U.S.C. 5313-5316), shall lapse.

88 Stat. 1249.

Savings clauses.

(b) All orders, determinations, rules, regulations, permits, contracts, certificates, licenses, and privileges —

(1) which have been issued, made, granted, or allowed to become effective by the President, any Federal department or agency or official thereof, or by a court of competent jurisdiction, in the performance of functions which are transferred under this Act, and

(2) which are in effect at the time this Act takes effect,

shall continue in effect according to their terms until modified, terminated, superseded, set aside, or revoked by the President, the Administrator, the Commission, or other authorized officials, a court of competent jurisdiction, or by operation of law.

(c) The provisions of this Act shall not affect any proceeding pending, at the time this section takes effect, before the Atomic Energy Commission or any department or agency (or component thereof) functions of which are transferred by this Act; but such proceedings, to the extent that they relate to functions so transferred, shall be continued. Orders shall be issued in such proceedings, appeals shall be taken therefrom, and payments shall be made pursuant to such orders, as if this Act had not been enacted; and orders issued in any such proceedings shall continue in effect until modified, terminated, superseded, or revoked by a duly authorized official, by a court of competent jurisdiction, or by operation of law. Nothing in this subsection shall be deemed to prohibit the discontinuance or modification of any such proceeding under the same terms and conditions and to the same extent that such proceeding could have been discontinued if this Act had not been enacted.

(d) Except as provided in subsection (f) —

(1) the provisions of this Act shall not affect suits commenced prior to the date this Act takes effect, and

(2) in all such suits proceedings shall be had, appeals taken, and judgments rendered, in the same manner and effect as if this Act had not been enacted.

(e) No suit, action, or other proceeding commenced by or against any officer in his official capacity as an officer of any department or agency, functions of which are transferred by this Act, shall abate by reason of the enactment of this Act. No cause of action by or against any department or agency, functions of which are transferred by this Act, or by or against any officer thereof in his official capacity shall abate by reason of the enactment of this Act. Causes of actions, suits, actions, or other proceedings may be asserted by or against the United States or such official as may be appropriate and, in any litigation pending when this section takes effect, the court may at any time, on its own motion or that of any party, enter any order which will give effect to the provisions of this section.

(f) If, before the date on which this Act takes effect, any department or agency, or officer thereof in his official capacity, is a party to a suit, and under this Act any function of such department, agency, or officer is transferred to the Administrator or Commission, or any other official, then such suit shall be continued as if this Act had not been enacted, with the Administrator or Commission, or other official, as the case may be, substituted.

(g) Final orders and actions of any official or component in the performance of functions transferred by this Act shall be subject to judicial review to the same extent and in the same manner as if such orders or actions had been made or taken by the officer, department, agency, or instrumentality in the performance of such functions immediately preceding the effective date of the Act. Any statutory requirements relating to notices, hearings, action upon the record, or administrative review that apply to any function transferred by this Act shall apply to the performance of those functions by the Administrator or Commission, or any officer or component.

88 Stat. 1250.

(h) With respect to any function transferred by this Act and performed after the effective date of this Act, reference in any other law to any department or agency, or any officer or office, the functions of which are so transferred, shall be deemed to refer to the Administration, the Administrator or Commission, or other office or official in which this Act vests such functions.

(i) Nothing contained in this Act shall be construed to limit, curtail, abolish, or terminate

any function of the President which he had immediately before the effective date of this Act; or to limit, curtail, abolish, or terminate his authority to perform such function; or to limit, curtail, abolish, or terminate his authority to delegate, redelegate, or terminate any delegation of functions.

(j) Any reference in this Act to any provision of law shall be deemed to include, as appropriate, references thereto as now or hereafter amended or supplemented.

(k) Except as may be otherwise expressly provided in this Act, all functions expressly conferred by this Act shall be in addition to and not in substitution for functions existing immediately before the effective date of this Act and transferred by this Act.

TRANSFER OF PERSONNEL AND OTHER MATTERS

SEC. 302. (a) Except as provided in the next sentence, the personnel employed in connection with, and the personnel positions, assets, liabilities, contracts, property, records, and unexpended balances of appropriations, authorizations, allocations, and other funds employed, held, used, arising from, available to or to be made available in connection with the functions and programs transferred by this Act, are, subject to section 202 of the Budget and Accounting Procedures Act of 1950 (31 U.S.C. 581c), correspondingly transferred for appropriate allocation. Personnel positions expressly created by law, personnel occupying those positions on

42 U.S.C. 5872.

the effective date of this Act, and personnel authorized to receive compensation at the rate prescribed for offices and positions at levels II, III, IV, or V of the Executive Schedule (5 U.S.C. 5313-5316) on the effective date of this Act shall be subject to the provisions of subsection (c) of this section and section 301 of this Act.

(b) Except as provided in subsection (c), transfer of nontemporary personnel pursuant to this Act shall not cause any such employee to be separated or reduced in grade or compensation for one year after such transfer.

(c) Any person who, on the effective date of this Act, held a position compensated in accordance with the Executive Schedule prescribed in chapter 53 of title 5 of the United States Code, and who, without a break in service, is appointed in the Administration to a position having duties comparable to those performed immediately preceding his appointment shall continue to be compensated in his new position at not less than the rate provided for his previous position.

INCIDENTAL DISPOSITIONS

42 U.S.C. 5873.

SEC. 303. The Director of the Office of Management and Budget is authorized to make such additional incidental dispositions of personnel, personnel positions, assets, liabilities, contracts, property, records, and unexpended balances of appropriations, authorizations, allocations, and other funds held, used, arising from, available

88 Stat. 1251.

to or to be made available in connection with functions transferred by this Act, as he may

deem necessary or appropriate to accomplish the intent and purpose of this Act.

DEFINITIONS

SEC. 304. As used in this Act— 42 U.S.C. 5874.

(1) any reference to "function" or "functions" shall be deemed to include references to duty, obligation, power, authority, responsibility, right, privilege, and activity, or the plural thereof, as the case may be; and

(2) any reference to "perform" or "performance", when used in relation to functions, shall be deemed to include the exercise of power, authority, rights, and privileges.

AUTHORIZATION OF APPROPRIATIONS

SEC. 305. (a) Except as otherwise provided by law, appropriations made under this Act shall be subject to annual authorization. 42 U.S.C. 5875.

(b) Authorization of appropriations to the Commission shall reflect the need for effective licensing and other regulation of the nuclear power industry in relation to the growth of such industry.

COMPTROLLER GENERAL AUDIT

SEC. 306. (a) Section 166. "Comptroller General Audit" of the Atomic Energy Act of 1954, as amended, shall be deemed to be applicable, respectively, to the nuclear and nonnuclear activities under title I and to the activities under title II. 42 U.S.C. 5876. 42 U.S.C. 2206.

Ante, pp. 1234, 1242.

(b) The Comptroller General of the United States shall audit, review, and evaluate the implementation of the provisions of title II of this Act by the Nuclear Safety and Licensing Commission not later than sixty months after the effective date of this Act, the Comptroller General shall prepare and submit to the Congress a report on his audit, which shall contain, but not be limited to —

Report to Congress.

(1) an evaluation of the effectiveness of the licensing and related regulatory activities of the Commission and the operations of the Office of Nuclear Safety Research and the Bureau of Nuclear Materials Security;

(2) an evaluation of the effect of such Commission activities on the efficiency, effectiveness, and safety with which the activities licensed under the Atomic Energy Act of 1954, as amended, are carried out;

(3) recommendations concerning any legislation he deems necessary, and the reasons therefor, for improving the implementation of title II.

REPORTS

Reports to the President and Congress. 42 U.S.C. 5877. Administration activities and progress.

SEC. 307. (a) The Administrator shall, as soon as practicable after the end of each fiscal year, make a report to the President for submission to the Congress on the activities of the Administration during the preceding fiscal year. Such report shall include a statement of the short-range and long-range goals, priorities, and plans of the Administration together with an assessment of the progress made toward the

attainment of those objectives and toward the more effective and efficient management of the Administration and the coordination of its functions.

Feasibility of transferring military application functions. 88 Stat. 1252.

(b) During the first year of operation of the Administration, the Administrator, in collaboration with the Secretary of Defense, shall conduct a thorough review of the desirability and feasibility of transferring to the Department of Defense or other Federal agencies the functions of the Administrator respecting military application and restricted data, and within one year after the Administrator first takes office the Administrator shall make a report to the President, for submission to the Congress, setting forth his comprehensive analysis, the principal alternatives, and the specific recommendations of the Administrator and the Secretary of Defense.

Commission activities and findings.

(c) The Commission shall, as soon as practicable after the end of each fiscal year, make a report to the President for submission to the Congress on the activities of the Commission during the preceding fiscal year. Such report shall include a clear statement of the short-range and long-range goals, priorities, and plans of the Commission as they relate to the benefits, costs, and risks of commercial nuclear power. Such report shall also include a clear description of the Commission's activities and findings in the following areas —

(1) insuring the safe design of nuclear power plants and other licensed facilities;

(2) investigating abnormal occurrences and defects in nuclear powerplants and other licensed facilities;

(3) safeguarding special nuclear materials at all stages of the nuclear fuel cycle;

(4) investigating suspected, attempted, or actual thefts of special nuclear materials in the licensed sector and developing contingency plans for dealing with such incidents;

(5) insuring the safe, permanent disposal of high-level radioactive wastes through the licensing of nuclear activities and facilities;

(6) protecting the public against the hazards of low-level radioactive emissions from licensed nuclear activities and facilities.

INFORMATION TO COMMITTEES

42 U.S.C. 5878. SEC. 308. The Administrator shall keep the appropriate congressional committees fully and currently informed with respect to all of the Administration's activities.

TRANSFER OF FUNDS

42 U.S.C. 5879. SEC. 309. The Administrator, when authorized in an appropriation Act, may, in any fiscal year, transfer funds from one appropriation to another within the Administration; except, that no appropriation shall be either increased or decreased pursuant to this section by more than 5 per centum of the appropriation for such fiscal year.

CONFORMING AMENDMENTS TO CERTAIN OTHER LAWS

SEC. 310. Subchapter II (relating to Executive Schedule pay rates) of chapter 53 of title 5, United States Code, is amended as follows:

(1) Section 5313 is amended by striking out "(8) Chairman, Atomic Energy Commission." and inserting in lieu thereof "(8) Chairman, Nuclear Regulatory Commission.", and by adding at the end thereof the following:

"(22) Administrator of Energy Research and Development Administration.".

(2) Section 5314 is amended by striking out "(42) Members, Atomic Energy Commission." and inserting in lieu thereof "(42) Members, Nuclear Regulatory Commission.", and by adding at the end thereof the following:

"(60) Deputy Administrator, Energy Research and Development Administration.".

(3) Section 5315 is amended by striking out paragraph (50), and by adding at the end thereof the following: 88 Stat. 1253.

"(100) Assistant Administrators, Energy Research and Development Administration (6).

"(101) Director of Nuclear Reactor Regulation, Nuclear Regulatory Commission.

"(102) Director of Nuclear Material Safety and Safeguards, Nuclear Regulatory Commission.

"(103) Director of Nuclear Regulatory Research, Nuclear Regulatory Commission.

"(104) Executive Director for Operations, Nuclear Regulatory Commission."

(4) Section 5316 is amended by striking out paragraphs (29), (62), (69), and (102), by striking out "(81) General Counsel of the Atomic Energy Commission," and inserting in lieu thereof "(81) General Counsel of the Nuclear

Regulatory Commission.", and by adding at the end thereof the following:

"(134) General Counsel, Energy Research and Development Administration.

"(135) Additional officers, Energy Research and Development Administration (8).

"(136) Additional officers, Nuclear Regulatory Commission (5).".

SEPARABILITY

42 U.S.C. 5801 note.

SEC. 311. If any provision of this Act, or the application thereof to any person or circumstance, is held invalid, the remainder of this Act, and the application of such provision to other persons or circumstances, shall not be affected thereby.

EFFECTIVE DATE AND INTERIM APPOINTMENTS

42 U.S.C. 5801 note. Publication in Federal Register.

SEC. 312. (a) This Act shall take effect one hundred and twenty days after the date of its enactment, or on such earlier date that the President may prescribe and publish in the Federal Register; except that any of the officers provided for in title I of this Act may be nominated and appointed, as provided by this Act, at any time after the date of enactment of this Act. Funds available to any department or agency (or any official or component thereof), any functions of which are transferred to the Administrator and the Commission by this Act, may, with the approval of the President, be used to pay the compensation and expenses of any officer appointed pursuant to this subsection until such time as funds for that purpose are otherwise available.

(b) In the event that any officer required by this Act to be appointed by and with the advice and consent of the Senate shall not have entered upon office on the effective date of this Act, the President may designate any officer, whose appointment was required to be made by and with the advice and consent of the Senate and who was such an officer immediately prior to the effective date of this Act, to act in such office until the office is filled as provided in this Act. While so acting, such persons shall receive compensation at the rates provided by this Act for the respective offices in which they act.

TITLE IV — SEX DISCRIMINATION

88 Stat. 1254.

SEX DISCRIMINATION PROHIBITED

42 U.S.C. 5891

SEC. 401. No person shall on the ground of sex be excluded from participation in, be denied a license under, be denied the benefits of, or be subjected to discrimination under any program or activity carried on or receiving Federal assistance under any title of this Act. This provision will be enforced through agency provisions and rules similar to those already established, with respect to racial and other discrimination, under title VI of the Civil Rights Act of 1964. However, this remedy is not exclusive and will not prejudice or cut off any other legal remedies available to a discriminatee.

42 U.S.C. 2000d.

Approved October 11, 1974.

LEGISLATIVE HISTORY

HOUSE REPORTS: No. 93-707 (Committee on Government Operations) and No. 93-1445 (Committee of Conference).

SENATE REPORT: No. 93-980 accompanying S. 2744 (Committee on Government Operations).

National Environmental Policy Act of 1969, § 102

SECTION 102. The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall —

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on —

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review processes;

(D) Any detailed statement required under subparagraph (C) after January 1, 1970, for any major Federal action funded under a program of grants to States shall not be deemed to be legally insufficient solely by reason of having been prepared by a State agency or official, if:

(i) the State agency or official has statewide jurisdiction and has the responsibility for such action,

(ii) the responsible Federal official furnishes guidance and participates in such preparation,

(iii) the responsible Federal official independently evaluates such statement prior to its approval and adoption, and

(iv) after January 1, 1976, the responsible Federal official provides early notification to, and solicits the views of, any other State or any Federal land management entity of any action or any alternative thereto

which may have significant impacts upon such State or Federal land management entity and, if there is any disagreement on such impacts, prepares a written assessment of such impacts and views for incorporation into such detailed statement.

The procedures in this subparagraph shall not relieve the Federal official of his responsibilities for the scope, objectivity, and content of the entire statement or of any other responsibility under this Act; and further, this subparagraph does not affect the legal sufficiency of statements prepared by State agencies with less than statewide jurisdiction.

(E) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(F) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(G) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(H) initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(I) assist the Council on Environmental Quality established by title II of this Act.

10 CFR § 51.20(e)

(e) In the Environmental Report required by paragraph (a) for light-water-cooled nuclear power reactors, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low level wastes and high level wastes related to uranium fuel cycle activities to the environmental costs of licensing the nuclear power reactor, shall be as set forth in the following table. No further discussion of such environmental effects shall be required.

TABLE S-3. — *Summary of environmental considerations for uranium fuel cycle*

[Normalized to model LWR annual fuel requirement]

Natural resource use	Total	Maximum effect per annual fuel requirement of model 1,000 MWe LWR
Land (acres):		
Temporarily committed	63	
Undisturbed area	45	
Disturbed area	18	Equivalent to 90 MWe coal-fired powerplant.
Permanently committed	4.6	
Overburden moved (millions of MT)	2.7	Equivalent to 90 MWe coal-fired powerplant.
Water (millions of gallons):		
Discharged to air	156	≈2 percent model 1,000 MWe LWR with cooling tower.
Discharged to water bodies	11,040	
Discharged to ground	123	
Total	11,319	<4 percent of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousands of MW-hour)	317	<5 percent of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT)	115	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	92	<0.2 percent of model 1,000 MWe energy output.
Effluents—chemical (MT):		
Gases (including entrainment):[1]		
SO_x	4,400	
NO_x[2]	1,177	Equivalent to emissions from 45 MWe coal-fired plant for a year.
Hydrocarbons	13.5	
CO	28.7	
Particulates	1,156	
Other gases:		
F-	.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards—below level that has effects on human health.
Liquids:		
$SO_4^=$	10.3	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constitutents that require dilution and the flow of dilution water are: NH_3—600 cfs. NO_3—20 cfs. Fluoride—70 cfs.
NO_3^-	26.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl^-	8.6	
Na^+	16.9	
NH_3	11.5	
Fe	.4	
Tailings solutions (thousands of MT)	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—Radiological (curies):		
Gases (including entrainment):		
Rn-222	75	Principally from mills—maximum annual dose rate <4 percent of average natural background within 5 mi of mill. Results in 0.06 man-rem per annual fuel requirement.
Ra-226	.02	
Th-230	.02	
Uranium	.032	
Tritium (thousand)	16.7	Principally from fuel reprocessing plants—Whole body dose is 6 man-rem per annual fuel requirements for population within 50 mi radius. This is <0.007 percent of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/yr has been included in fission products and transuranics total.
Kr-85 (thousands)	350	
I-129	.0024	
I-131	.024	
Fission products and transuranics	1.01	
Liquids:		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production-concentration 5 percent of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Ru-106[3]	.15	From reprocessing plants—maximum concentration 4 percent of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (thousands)	2.5	
Solids (buried):		
Other than high level	601	All except 1 Ci comes from mills—included in tailings returned to ground—no significant effluent to the environment, 1 Ci from conversion and fuel fabrication is buried.
Effluents — Thermal (billions of British Thermal Units)	3,360	<7 percent of model 1,000 MWe LWR.
Transportation (man-rem): Exposure of workers and general public	.334	

[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.2 percent from natural gas use and process.
[3] Co-137 (0.075 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

Supreme Court, U. S.
FILED
JUN 2 1977
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APPENDIX

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.,

Respondents

No. 76-528

CONSUMERS POWER COMPANY,

Petitioner

v.

NELSON AESCHLIMAN, ET AL.,

Respondents

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

PETITIONS FOR WRITS OF CERTIORARI FILED
SEPTEMBER 21 AND OCTOBER 14, 1976
CERTIORARI GRANTED FEBRUARY 22, 1977

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GENERAL DOCKET

UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

DATE	FILINGS — PROCEEDINGS	Filed

[No. 74-1385]

(G) 3-27-74 4 — Petitioners' petition for review of an order of the AEC (m-27)

(G) 3-28-74 Certified copy of petition for review of an order of the AEC was mailed to AEC & United States Attorney General

(G) 4-4-74 4 — Motion of Vermont Yankee Nuclear Power Corporation for leave to intervene (m-2)

(B) 4-30-74 Clerk's order granting motion of Vermont Yankee Nuclear Power Corp., leave to intervene; Counsel for intervenor may participate in oral argument only to the extent allowable under Rule 12 of the General Rules of this Court

(G) 5-6-74 Certified Index to Record (n-4)

(G) 6-11-74 4 — Petitioners' motion to extend time to file brief to July 26th (m-7)

(B) 6-21-74 Clerk's order granting petitioners' motion to extend time to file brief; and time for filing petitioners' brief is extended to July 21st

(G) 6-26-74 4 — Petitioners' motion to consolidate with No. 74-1586 (m-26)

(L) 7-5-74 4 — Respondents' opposition to motion to consolidate (m-5)

(B) 7-8-74 4 — Opposition of intervenor, Vermont Yankee Nuclear Power Corp., to motion to consolidate (m-8)

(G) 7-15-74 4 — Petitioners' motion to extend time to file brief to August 25th (m-15)

(G) 7-15-74 4 — Petitioners' reply to respondents' and intervenor's opposition to motion to consolidate (m-15)

(I) 8-16-74 4 — Petitioners' motion to extend time to file brief to 30 days from the date of order granting or denying petitioners' motion to consolidate (m-16)

DATE	FILINGS — PROCEEDINGS	Filed
(M)10-3-74	Order per CJ Bazelon denying motions to consolidate; the time for filing petitioners brief in this case is extended to November 2nd; sua sponte, that the Clerk is directed to schedule this appeal for oral argument on the same day and before the same panel of this Court as appeal no. 74-1586	
(G)11-1-74	4 — Petitioners' motion for leave to file a deferred appendix (m-1)	
(L)11-4-74	7 — Petitioner's Brief (m-4)	
(B)11-12-74	Clerk's order granting parties leave to proceed under the provisions of Rule 30(c) FRAP, in lieu of submitting one copy of the typewritten or page proof brief provided under Rule 30(c) FRAP, counsel for parties shall submit 7 copies thereof for filing	
(G)11-12-74	4 — Petitioners' motion to correct errors in brief (m-12)	
(M)11-18-74	Clerk's order granting motion of petitioners' to correct errors in brief	
(M)11-27-74	4 — Respondent's motion to extend time to file brief to February 7th (m-26)	
(M)11-29-74	4 — Motion of the Intervenor Vermont Yankee Nuclear Power Corp. to extend time to file brief to February 7th (m-26)	
(M)12-4-74	Clerk's order granting respondent's motion to extend time to file brief to February 7, 1974	
(M)12-5-74	Clerk's order granting motion of the intervenor Vermont Yankee Nuclear Power Corp. to extend time to file brief to February 7th	
(I) 2-5-75	7 — Brief for The Intervenor (Vermont Yankee Nuclear Power Corp.) (m-4)	
(L) 2-7-75	7 — Respondent's Brief (m-7)	
(L) 2-7-75	4 — Motion of United States Nuclear Regulatory Commission to substitute NRC for AEC as a respondent in this case (m-7)	
(G) 2-12-75	Clerk's order granting respondent's motion for substitution of party and the Clerk is directed to remove the United States Atomic Energy Commission from the docket as respondent and substitute therefor the United States Nuclear Regulatory Commission	

DATE	FILINGS — PROCEEDINGS	Filed
(B) 2-21-75	7 — Petitioner's typewritten reply brief (m-21)	
(B) 2-27-75	7 — Joint appendix (m-27)	
(B) 3-10-75	15 — Respondents' brief (m-5)	
(B) 3-10-75	25 — Brief for Intervenor Vermont Yankee Nuclear Power Corp., (m-7)	
(B) 3-13-75	15 — Petitioner's brief (m-13)	
(B) 3-13-75	15 — Petitioner's reply brief (m-13)	
(R) 5-8-75	Clerk's order sua sponte, that this appeal is consolidated with appeal no. 74-1586 for oral argument; sua sponte, that the following times are allotted for oral argument; Petitioners in both cases — 30 minutes (to be divided as they see fit) and respondent — 30 minutes	
(K) 5-15-75	4 — Joint motion for reconsideration of order consolidating oral arguments in 74-1385 and 74-1586 (m-14)	
(K) 5-15-75	Letter from Respondent advising of additional authorities pursuant to Local Rule 8(g)	
(R) 5-22-75	Clerk's order denying the motion for reconsideration; the Court will consider extending time available to each side at argument if circumstances warrant	
(K) 5-22-75	4 — Petitioner's motion for leave to allow three counsel to argue for petitioners (m-22)	
(R) 5-27-75	Argued before CJ Bazelon; George C. Edward, Jr., CJ for the Sixth Circuit, sitting by designation; and Tamm, CJ	
(R) 5-28-75	Per Curiam order granting motion for leave to permit three counsel to argue for petitioners; CJ Bazelon; Edwards, U.S. CJ for the Sixth Circuit, sitting by designation; and Tamm, CJ	
7-21-76	Opinion for the Court filed by Chief Judge Bazelon.	
7-21-76	Separate statement of Chief Judge Bazelon.	
7-21-76	Separate statement filed by Circuit Judge Tamm, concurring in result.	
7-21-76	Judgment remanding case to the NRC.(n)	
(C) 8-2-76	4 — Intervenor's motion to extend time to file petition for rehearing to Aug. 25 (m-30)	

DATE	FILINGS — PROCEEDINGS	Filed
(H) 8-3-76	4 — Respondents' motion to extend time to file petition for rehearing and/or suggestion for rehearing en banc to August 25, 1976 (m-2)	
(C) 8-6-76	4 — Petitioners' opposition to motions to extend time to file petition for rehearing (m-5)	
(C) 8-6-76	4 — Petitioners' motion for issuance of mandate forthwith (m-5)	
(C) 8-11-76	4 — Respondents' motion for stay of mandate (m-11)	
(C) 8-12-76	4 — Intervenor's opposition to petitioners' motion for issuance of mandate forthwith (m-10)	
(K) 8-20-76	Per Curiam order that the motions of intervenor-appellee Vermont Yankee Nuclear Power Corp., of intervenors Baltimore Gas and Electric Co., et al and respondents NRC and US to extend time to file petitions for rehearing to August 25, 1976 are granted; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation and Tamm, CJ	
(K) 8-23-76	Per Curiam order that petitioners' motion for issuance of mandate forthwith is denied; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit sitting by designation and Tamm, CJ	
(K) 8-23-76	Per Curiam order that respondents' US and NRC motion for stay of mandate pending decision on their motion to extend time to file petition for rehearing and/or suggestion for rehearing en banc is granted; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation, and Tamm, CJ	
(K) 8-23-76	4 — Intervenor's (Vermont Yankee Nuclear Power Corp.) motion for stay of mandate (m-20)	
(K) 8-23-76	4 — Respondents' motion for stay of mandate and correction of opinion (m-20) (Ok, GF)	
(G) 8-25-76	4 — Petitioners' opposition to motion for stay and correction of opinion (m-24)	
(C) 8-26-76	4 — Motion of Robert Jeffers, David Hensler, Patrick Raher & George W. Mayo, Jr. to withdraw as counsel for petitioner NRDC (m-26)	
(G) 9-1-76	4 — Respondents' reply to opposition to motion for stay of mandate (m-30)	

DATE	FILINGS — PROCEEDINGS	Filed
(G) 9-17-76	4 — Respondents' motion for further stay of mandate (m-15)	
(C) 9-23-76	Notice from Clerk, Supreme Court that writ of certiorari was filed in SC No. 76-419 on Sept. 21	
(K) 10-7-76	Per Curiam order that the motion of Robert M. Jeffers, David J. Hensler, Patrick M. Raher and George W. Mayo, Jr., to withdraw their appearances as counsel for petitioner Natural Resources Defense Council, Inc., is granted; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit sitting by designation and Tamm, CJ	
(K) 10-8-76	Per Curiam order that the Clerk is directed to file the document titled "Stipulation" which had been lodged in the Clerk's Office by petitioners on 8/16/76, and that the motions for stay of mandate are granted, and the Clerk is directed not to issue the mandate herein prior to October 31, 1976, on condition that the United States Nuclear Regulatory Commission shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation and Tamm, CJ	
(K) 10-8-76	4 — Stipulation of Petitioners dated 8/16/76	
(K) 10-8-76	Per Curiam order that respondents' motion for correction of this Court's opinion dated July 21, 1976, is granted in part, and the opinion dated July 21, 1976 is amended as follows: On page 34, delete lines 3-5. On page 34, delete footnote 53 and renumber all succeeding footnotes. On page 41, delete the following from footnote 59: "In this case the board members asked no questions whatsoever of Dr. Pittmann. *See supra* note 53." In all other respects, respondents motion for correction is denied; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation and Tamm, CJ	
(C) 10-15-76	Copy of letter from Clerk, Supreme Court extending time to file petition for writ of certiorari in No. A-285 to Nov. 18	
(H) 11-8-76	4 — Letter from NRC advising of additional authorities pursuant to Rule 8(g)	

DATE	FILINGS — PROCEEDINGS	Filed
(H) 11-19-76	4 — Petitioner's motion for clarification of the stay of mandate issued on October 8th (m-19)	
(H) 11-29-76	4 — Respondents' motion to extend time to file respond to motion for clarification of the stay of mandate issued on October 8 (m-24)	
(R) 2-17-77	Per Curiam order that the motion of respondents U.S. Nuclear Regulatory Comm. and USA and of intervenors Vermont Yankee Nuclear Power Corp. and Baltimore Gas and Electric Co. is granted and the Clerk is directed to file the response to petitioners' motion for clarification; the petitioners' motion for clarification is denied; CJ Bazelon; Edwards, U.S. CJ for the Sixth Circuit; sitting by designation; and Tamm, CJ	
(R) 2-17-77	4 — Opposition of the intervenor Vermont Yankee Nuclear Power Corp. to the motion of the petitioners "For Clarification of the stay of mandate" (m-27)	
(C) 2-17-77	4 — NRC's response to petitioners' motion for clarification of the stay of mandate (m-Dec. 6) (OK, GF)	

[No. 74-1586]

(L) 6-7-74	4 — Petitioner's petition for review of an order of the AEC (m-7)	
(L) 6-7-74	Certified copy of a petition for review of an order of the AEC was mailed to AEC and the U.S. Attorney General	
(G) 6-27-74	4 — Petitioners' motion to consolidate with No. 74-1385 (m-26)	
(L) 7-5-74	4 — Respondents' opposition to motion to consolidate (m-5)	
(B) 7-8-74	4 — Motion of Baltimire Gas and Electric Company, et al., for leave to intervene (m-8)	
(B) 7-8-74	4 — Opposition of intervenor, Vermont Yankee Nuclear Power Corp., to motion to consolidate (m-8)	
(L) 7-15-74	4 — Supplemental Certificate of Service for filing the petition for review	
(M) 7-17-74	Clerk's order granting motions by Baltimore Gas and Electric Co., Boston Edison Co., Consumers Power Co., Long Island Lighting Co., New England Electric System, Northeast Utilities Co., Pacific Gas & Electric Co., Philadelphia Electric	

DATE	FILINGS — PROCEEDINGS	Filed
	Co., Public Service Electric & Gas Co., San Diego Gas & Electric Co., Southern California Edison Co., Virginia Electric & Power Co., and Yankee Atomic Electric Co., for leave to intervene; counsel for the intervenors are encouraged to file joint briefs whenever practicable and may participate in oral argument only to the extent allowable under Rule 12 of the General Rules of this Court	
(L) 7-17-74	Certified Index to the Record (n-4) (m-17)	
(L) 7-26-74	4 — Petitioners' motion for leave to proceed under Rule 30(c) deferred appendix (m-26)	
(M) 8-2-74	Clerk's order that the parties are granted leave to proceed under Rule 30(c) of the FRAP; in lieu of submitting one copy of the typewritten or page proof brief provided under Rule 30(c) of the FRAP, counsel for the parties shall submit seven copies thereof for filing	
(L) 8-5-74	4 — Intervenor's (Balt. Gas & Electric Co., et al) motion to substitute (4) electric utility companies in place and stead of Intervenor Northeast Utilities Company; (Connecticut Light & Power Company; Hartford Electric Light Company; Western Massachusetts Electric Company; Northeast Nuclear Energy Co.;) and to substitute New England Power Company in place of New England Electric System (m-5)	
(I) 8-16-74	4 — Petitioners' motion to extend time to file brief to 30 days from the date of order granting or denying petitioners' motion to consolidate (m-16)	
(G) 8-22-74	4 — Intervenor's motion for leave to file (Baltimore Gas & Electric Company, et al.) opposition to motion to consolidate nos. 74-1385 and 74-1586 (m-23)	
(M) 8-29-74	Order per Wright ACJ, granting intervenors' (Baltimore Gas & Electric Co., et al) motion to substitute the following four electric utility companies instead of intervenor, Northeast Utilities Co.: *The Connecticut Light & Power Company*; *The Hartford Electric Light Company*; *Western Massachusetts Electric Company*; and *Northeast Nuclear Energy Company*; and intervenors' also move to substitute *New England Power Company* in place of New England Electric System	

DATE	FILINGS — PROCEEDINGS	Filed
(M) 10-3-74	Order per CJ Bazelon denying motions to consolidate; the time for filing petitioners' brief in the appeal is extended to November 2nd; sua sponte, that the Clerk is directed to schedule this case for oral argument on the same day and before the same panel of this Court as appeal No. 74-1385	
(L) 11-4-74	7 — Petitioners' Brief (m-4)	
(G) 11-12-74	4 — Petitioners' motion to correct errors in brief (m-12)	
(M) 11-18-74	Clerk's order granting petitioners' motion to correct errors in brief	
(M) 11-27-74	4 — Respondent's motion to extend time to file brief to February 7th (m-26)	
(M) 11-29-74	4 — Intervenors' Baltimore Gas and Electric Co., et al motion to extend time to file brief to February 7th (m-27)	
(M) 12-4-74	Clerk's order granting respondent's motion to extend time to file brief to Feb. 7th	
(M) 12-5-74	Clerk's order granting intervenors' Baltimore Gas and Electric Co., et al to extend time to file brief to February 7th	
(B) 12-9-74	4 — Motion of Commonwealth Edison Company, et al., for leave to file brief amici curiae (m-9)	
(M) 12-27-74	Order per CJ Bazelon granting motion of Commonwealth Edison Co., et al for leave to file brief amici curiae	
(M) 12-27-74	25 — Brief for Amici Curiae Commonwealth Edison Co., et al (m-9)	
(I) 1-28-75	4 — Respondents' motion to extend time to file brief to March 24th (m-28)	
(G) 2-6-75	4 — Petitioners' opposition to motion to extend time to file brief (m-6)	
(L) 2-10-75	7 — Intervenors' Brief (m-7)	
(R) 2-14-75	Order per CJ Bazelon that the time for filing respondents' brief is extended to March 11, 1975; the time for filing petitioners' reply brief, if any, to respondent and intervenors' briefs is extended for a period of 14 days from the date respondents' brief is filed	

DATE	FILINGS — PROCEEDINGS	Filed
(B) 3-12-75	4 — Respondent's motion for substitution of party (m-12)	
(B) 3-12-75	7 — Respondent's typewritten brief (m-12)	
(R) 3-18-75	Order per Wright ACJ, granting respondents' motion for substitution of party respondent and the Clerk is directed to substitute the U.S.N.R.C. for the U.S.A.E. commission as a party respondent in this case	
(K) 3-26-75	4 — Motion of the State of New York for leave to file brief as Amicus Curiae (Ok RB) (m-20)	
(K) 3-31-75	7 — Petitioners' Reply Brief (m-28)	
(K) 4-7-75	4 — Intervenors' response to motion by State of New York for leave to file amicus curiae brief, time having expired (m-4)	
(K) 4-7-75	4 — Respondents' reply to the State of New York's motion for leave to file brief as amicus curiae (m-4)	
(R) 4-9-75	Order per Wright ACJ, granting motion of the State of New York for leave to file a brief as amicus curiae out of time and the Clerk is directed to file the brief of the state of New York as amicus curiae	
(R) 4-9-75	25 — Amcus curiae brief for State of New York (m-20)	
(K) 4-9-75	4 — Petitioners' motion for leave to correct errata sheet (m-9)	
(K) 4-11-75	7 — Joint Appendix (Volumes I and II) (m-11)	
(R) 4-15-75	Clerk's order granting petitioners' motion for leave to correct errata sheet	
(G) 4-16-75	25 — Petitioners' brief (m-17)	
(G) 4-16-75	25 — Petitioners' reply brief (m-17)	
(R) 4-18-75	Order per Wright ACJ, sua sponte, that the order filed April 9th is amended by adding the following paragraph: Counsel for the parties, if they be so advised, may file answers to the amicus curiae brief within 20 days from the date of this order. Counsel for the parties shall provide 15 copies of their respective answers to the Court for filing	
(K) 4-28-75	15 — Intervenors' Brief (m-25)	

DATE	FILINGS — PROCEEDINGS	Filed
(K) 4-28-75	15 — Respondents' Brief (m-25)	
(G) 5- 8 -75	15 — Intervenor's reply brief to State of New York's amicus curiae brief (m-7)	
(G) 5- 9 -75	15 — Respondents' reply to brief for State of New York as amicus curiae (m-8)	
(R) 5- 8-75	Clerk's order sua sponte, that this appeal is consolidated with appeal no. 74-1385 for oral argument; sua sponte, that the following times are allotted for oral argument; Petitioners in both cases — 30 minutes (to be divided as they see fit) and Respondent — 30 minutes	
(G) 5-14-75	Letter from petitioners' advising of additional authorities pursuant to Local Rule	
(K) 5-15-75	4 — Joint motion for reconsideration of order consolidating oral arguments in Nos. 74-1385 and 74-1586 (m-14)	
(R) 5-22-75	Clerk's order denying motion for reconsideration; the Court will consider extending the time available to each side at argument if circumstances warrant	
(K) 5-22-75	4 — Petitioner's motion for leave to allow three counsel to argue for petitioners (m-22)	
(R) 5-27-75	Argued before CJ Bazelon; George C. Edwards, Jr., CJ for the Sixth Circuit, sitting by designation; and Tamm, CJ'	
(R) 5-27-75	Per Curiam order granting motion for leave to permit three counsel to argue for petitioners; CJ Bazelon; Edwards, U.S. CJ for the Sixth Circuit, sitting by desingation and Tamm, CJ	
(K) 5-29-75	Letter from Petitioner advising of additional authorities pursuant to Local Rule 8(g)	
(K) 6- 3 -75	Letter from Intervenor advising of additional authorities pursuant to Local Rule 8(g)	
(K) 7- 8 -75	Return receipt from George C. Freeman for order of 5/27/75	
(K) 9-24-75	Letter from Petitioner advising of additional authorities pursuant to Local Rule 8(g)	
(H) 1-19-76	3 — Environmental Survey of the Nuclear Fuel Cycle, lodged by appellee, USNRC per DMC	

DATE	FILINGS — PROCEEDINGS	Filed
7-21-76	Opinion for the Court filed by Chief Judge Bazelon.	
7-21-76	Separate statement of Chief Judge Bazelon.	
7-21-76	Separate statement filed by Circuit Judge Tamm, concurring in result.	
7-21-76	Judgment remanding case to the NRC. (n)	
(H) 8- 3 -76	4 — Respondents' motion to extend time to file petition for rehearing and/or suggestion for rehearing en banc to August 25, 1976 (m-2)	
(C) 8- 4 -76	4 — Motion of Baltimore Gas and Electric Co., et al. to extend time to file petition for rehearing to Aug. 25 (m-4)	
(C) 8- 6 -76	4 — Petitioners' opposition to motions to extend time to file petition for rehearing (m-5)	
(C) 8- 6 -76	4 — Petitioners' motion for issuance of mandate forthwith (m-5)	
(C) 8-11-76	4 — Respondents' motion for stay of mandate (m-11)	
(K) 8-20-76	Per Curiam order that the motions of intervenor-appellee Vermont Yankee Nuclear Power Corp., of intervenors Baltimore Gas and Electric Co., et al and respondents NRC and US to extend time to file petitions for rehearing to August 25, 1976 are granted; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation and Tamm, CJ	
(K) 8-23-76	Per Curiam order that petitioners' motion for issuance of mandate forthwith is denied CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation and Tamm, CJ	
(K) 8-23-76	Per Curiam order that respondents' US and NRC motion for stay of mandate pending decision on their motion to extend time to file petition for rehearing and/or suggest for rehearing en banc is granted; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation and Tamm, CJ	
(K) 8-23-76	4 — Respondents' motion for stay of mandate and correction of opinion (m-20) (Ok GF)	
(G) 8-25-76	4 — Petitioners' opposition to motion for stay and correction of opinion (m-24)	

DATE	FILINGS — PROCEEDINGS	Filed
(G) 8-25-76	4 — Intervenors' (Baltimore Gas & Electric Co., et al.) motion for stay of mandate (m-25)	
(C) 8-26-76	4 — Motion of Robert Jeffers, David Hensler, Patrick Raher & George Mayo, Jr., to withdraw as counsel for petitioner NRDC (m-26)	
(G) 8-30-76	Return receipt from counsel for intervenor in No. 74-1586 for certified copy of order filed August 20, 1976	
(G) 9-1-76	4 — Respondents' reply to opposition to motion for stay of mandate (m-30)	
(G) 9-17-76	4 — Respondents' motion for further stay of mandate (m-15)	
(C) 9-23-76	Notice from Clerk, Supreme Court that writ of certiorari was filed on Sept. 21 in SC No. 76-419	
(K)10-7-76	Per Curiam order that the motion of Robert M. Jeffers, David J. Hensler, Patrick M. Raher and George W. Mayo, Jr., to withdraw their appearances as counsel for petition; Natural Resources Defense Council, Inc., is granted; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation and Tamm, CJ	
(K)10-8-76	Per Curiam order that the Clerk is directed to file the document titled "Stipulation" which had been lodged in the Clerk's Office by petitioners on 8/16/76, and that the motions for stay of mandate are granted, and the Clerk is directed not to issue the mandate herein prior to October 31, 1976, on condition that the United States Nuclear Regulatory Commission shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit, sitting by designation and Tamm, CJ	
(K)10-8-76	4 — Stipulation of Petitioners dated 8/16/76	
(K)10-8-76	4 — Petitioner's (in #74-1586) opposition to motion of Intervenor, Baltimore Gas & Electric Co. for stay of mandate (m-7)	
(K)10-8-76	Per Curiam order that respondents' motion for correction of this Court's opinion dated July 21, 1976, is granted in part, and the opinion dated July 21, 1976 is amended as follows: On page 34, delete	

DATE	FILINGS — PROCEEDINGS	Filed
	lines 3-5. On page 34, delete footnote 53 and renumber all succeeding footnotes. On page 41, delete the following from footnote 59: "In this case the board members asked no questions whatsoever of Dr. Pittmann. *See supra* note 53." In all other respects, respondents motion for correction is denied; CJ Bazelon; Edwards, U.S. Circuit Judge for the Sixth Circuit sitting by designation and Tamm, CJ	
(C)10-15-76	Copy of letter from Clerk, Supreme Court extending time to file petition for writ of certiorari in No. A-285 to Nov. 18	
(C)10-26-76	Notice of filing of certiorari in SC No. 76-548 on Oct. 19	
(H)11-8-76	4 — Leter from NRC advising of additional authorities pursuant to Local Rule 8(g)	
(H)11-19-76	4 — Petitioner's motion for clarification of the stay of mandate issued on October 8, 1976 (m-19)	
(H)11-29-76	4 — Respondents' motion to extend time to file response to motion for clarification of the stay of mandate filed on October 8, 1976	
(R) 2-17-77	Per Curiam order that the motion of respondents U.S. Nuclear Regulatory Comm. and USA and of Intervenors Vermont Yankee Nuclear Power Corp. and Baltimore Gas and Electric Co. is granted and the Clerk is directed to file the response to petitioners' motion for clarification; the petitioners' motion for clarification is denied; CJ Bazelon; Edwards, U.S. CJ for the Sixth Circuit, sitting by designation; and Tamm, CJ	
(R) 2-17-77	4 — Opposition to intervenors Baltimore Gas and Electric Co., et al to petitioners' motion for clarification of the stay of mandate (m-6)	
(C) 2-17-77	4 — NRC's response to petitioners' motion for clarification of stay of mandate (m-Dec. 6) (OK, GF)	

[No. 73-1776]

(S) 7-16-73	4 — Petitioners' petition for review of an order of the AEC & US (m-16)	
(S) 7-18-73	Certified copy of petition for review of an order of the AEC mailed to the AEC and to the Attorney General of the United States	

DATE	FILINGS — PROCEEDINGS	Filed
(S) 7-24-73	4 — Motion of Consumers Power Co., for leave to intervene (m-24)	
(S) 8-13-73	4 — Motion of Dow Chemical Co., for leave to intervene (m-10)	
(S) 8-17-73	Certified Index to Record (n-4) (m-17)	
(M) 8-23-73	Clerk's order grantings motions by Consumers Power Company a Michigan Corp., and The Dow Chemical Co., for leave to intervene; counsel for the intervenors may participate in oral argument only to the extent allowable under Rule 12 (c) of the General Rules of this Court	
(S) 9-14-73	4 — Petitioners' motion to extend time to file briefs to October 26th (m-12)	
(S) 9-19-73	4 — Intervenors' (Consumers Power Co.) opposition to motion of Petitioners' to extend time to file briefs (m-18)	
(M) 10-1-73	Order per CJ Bazelon granting petitioners' motion to extend time to file brief and the time for filing a petitioners' brief is extended to October 26, 1973.	
(G) 11-1-73	4 — Motion of intervenor Dow Chemical Co., to extend time to file brief and to file one single brief in this case and No. 73-1867 (m-30)	
(S) 11-8-73	4 — Intervenor's (Dow Chemical Co.) motion to extend time to file brief to January 15th (m-6)	
(M) 11-14-73	Order per CJ Bazelon directing clerk to file petitioners' motion to extend time to file brief in no. 73-1867; time for fling petitioners brief in no. 73-1867 is extended to November 30th; sua sponte, that nos. 73=1776 and 73-1867 are consolidated for all purposes; the intervenor (The Dow Chemical Co) may file its brief on the same date respondents' briefs are due to be filed in this consolidated case	
(M) 11-14-73	4 — Petitioners' motion to extend time to file brief — granted	
(S) 11-14-73	4 — Intervenor's motion to extend time to file brief to January 15th (m-13)	
(S) 11-19-73	4 — Respondent's motion to file single brief for both consolidated cases simultaneously (m-16)	

DATE	FILINGS — PROCEEDINGS	Filed
(M) 11-23-73	Clerk's order granting motion by Consumers Power Co. to extend time to file brief to January 15th and the time for filing intervenors brief is extended to January 15th	
(S) 12-3-73	4 — Petitioners' (Mapleton) motion for leave to file brief, time having expired (m-30)	
(S) 12-5-73	4 — Intervenor's (Consumers Power Co.) response to motion for leave to file brief time having expired (m-4)	
(S) 12-4-73	4 — Respondent's motion for leave to file copy of order to show cause (m-4)	
(I) 12-27-73	4 — Respondents' motion for leave to file memorandum and order (m-26)	
(I) 1-3-74	4 — Intervenor Consumers Power Co., motion to file a single brief (m-2)	
(B) 1-9-74	Clerk's order granting motion of intervenor Consumers Power Co., to file a single brief and time for filing intervenor's brief is extended to 30 days from the date petitioner's brief is filed in no. 73-1867	
(M) 1-11-74	Per Curiam order directing Clerk to file motion by petitioners in 73-1867 to extend time to file brief; petitioners' motion in 73-1776 for leave to file brief is granted; counsel for respondent in the consolidated cases shall file with the Court January 26th, either a notice of decision declining to reopen the proceedings, or a motion to remand the cases for further proceedings in the event it is inclined to grant the motion to reopen the proceeding filed with respondent by petitioners in 73-1867; in the event that the respondent declines to grant the motion to reopen the proceedings, petitioners in 73-1867 shall have 15 days from the date of that decision in which to file their brief, and respondent may file a single brief for both cases which shall be due within 30 days from the date of service of petitioners' brief in 73-1867; Petitioners' in the consolidated cases are granted leave to proceed under Rule 30 (c) of the FRAP, and the parties are encouraged to agree as to the contents of the appendix; the Clerk is directed to file the memorandum and order submitted by respondent; Wright and Robinson, CJ	

DATE	FILINGS — PROCEEDINGS	Filed
(M) 1-11-74	25 — Petitioner's brief (m-3)	
(M) 1-11-74	4 — Memorandum and Order submitted by respondent (m-20)	
(L) 1-25-74	4 —Respondents' decision declining to reopen administrative proceedings (m-24)	
(L) 2-21-74	4 — Respondent's motion for leave to file Supplemental Index (m-20)	
(L) 3- 8 -74	4 — Motion of Intervenor (Dow Chemical Company) for leave to withdraw as intervenor (m-7)	
(B) 3-12-74	Order per CJ Bazelon granting respondent's motion for leave to file supplemental index to record and copies of two Commission Memorandums and Orders dated February 5 and February 20, 1974; Clerk is directed to file the lodged supplemental index to record and copies of two Commission Memorandums and Orders of the aforesaid date	
(B) 3-12-74	Supplemental certified index to record	
(B) 3-12-74	2 — Order to show cause	
(L) 3-21-74	4 — Intervenor's (Consumers Power Company) motion to extend the time to file brief to May 1st (m-21)	
(L) 3-22-74	4 — Respondents' consent motion to extend the time to file brief to May 1st (m-21)	
(M) 3-25-74	Order per CJ Bazelon granting motion of the Dow Chemical Co. for leave to withdraw as an intervenor and the Clerk is directed to make the appropriate notation in the records of his office to reflect the action	
(M) 3-27-74	Clerk's order granting motion to extend time to file brief of respondent and of the Intervenor Consumers Power Co., and the time for filing briefs by respondent and intervenor is extended to May 1, 1974	
(M) 4-19-74	Clerk's order granting motion of the State of Kansas for leave to file brief as amicus curiae beyond the time allowed in case no. 73-1867 and the Clerk is directed to file the brief as amicus curiae	
(M) 4-19-74	25 — Brief amcus curiae for State of Kansas (m-29)	
(L) 5-1-74	7 — Intervenor's (Consumer Power Company) Brief (m-1)	

DATE	FILINGS — PROCEEDINGS	Filed
(L) 5-3-74	7 — Respondent's Brief (m-1)	
(L) 5-10-74	4 — Respondent's motion for leave to file supplemental index to record (m-9)	
(M) 5-30-74	Clerk's order granting respondent's motion for leave to file supplemental index to record	
(M) 5-30-74	Supplemental Certified index to record (m-5)	
(G) 8-23-74	4 — Petitioners' motion for leave to file joint appendix instanter (m-22)	
(M) 9-3-74	Clerk's order granting petitioners' motion for leave to file joint appendix and the Clerk is directed to file petitioners' joint appendix	
(M) 9-3-74	7 — Joint Appendix Vols. I, II, III, IV, V and VA	
(L) 9-6-74	25 — Respondent's Brief (m-29)	
(L) 9-9-74	25 — Intervenor's (Consumers Power Co.) Brief (m-9)	
(G) 10-3-74	4 — Respondents' motion for leave to file a copy of an initial decision of the Atomic Safety and Licensing Board dated September 25, 1974 (m-1)	
(M) 10-18-74	Clerk's order directing the Clerk to lodge all copies of the documents	
(M) 10-18-74	4 — document entitled Petition for reconsideration of an Initial Decision of the A.S.L.B. — LODGED	
(M) 11-27-74	Argued before CJ Bazelon and Fahy, Sr. CJ and William Wayne Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(R) 4-8-75	Per Curiam order sua sponte, that these cases are hereby held in abeyance pending the decision of this Court in Natural Resources Defense Council, Inc. et al v. United States Nuclear Regulatory Commission, et al, No. 74-1586 which will be scheduled for argument on the merits during the May-June sitting period; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(K) 10-20-75	Appearance	
7-21-76	Opinion for the Court filed by Chief Judge Bazelon.	
7-21-76	Judgment remanding case to the Nuclear Regulatory Commission.	

DATE	FILINGS — PROCEEDINGS	Filed
(C) 8-2-76	4 — Intervenor's motion to extend time to file petition for rehearing and/or suggestion for rehearing en banc to Aug. 25 (m-2)	
(H) 8-3-76	4 — Petitioners' motion to extend time to file bill of costs (m-2)	
(H) 8-3-76	4 — Respondents' motion to extend time to file petition for rehearing and/or suggestion for rehearing en banc (m-2)	
(C) 8-4-76	4 — Petitioners' opposition to intervenor's motion to extend time to file petition for rehearing (m-2)	
(G) 8-11-76	4 — Intervenor's (Consumers Power Company) motion to stay issuance of mandate (m-11)	
(C) 8-11-76	4 — Respondents' motion for stay of mandate (m-11)	
(C) 8-11-76	4 — Intervenor's (Consumers Power Co.) motion to stay issuance of mandate (m-11)	
(H) 8-18-76	4 — Petitioners' motion to extend time to file bill of costs (m-17)	
(R) 8-18-76	Per Curiam order that the motions of respondent-intervenor Consumers Power Co. and respondents NRC and USA to stay issuance of mandate during the pendency of there motions to extend the time within which they may file petitions for rehearing are granted; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(R) 8-18-76	Per Curiam order that the motions of respondent-intervenor Consumers Power Co. and of respondents Nuclear Regulatory Comm and USA to extend time within which to file their petitions for reharing and suggestion for rehearing en banc to August 25th is granted; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(R) 8-18-76	Per Curiam order that petitioners' motion to extend time to file their bill of costs is granted; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(C) 8-23-76	4 — Respondents' motion for stay of mandate (m-20)	
(C) 8-23-76	4 — Intervenor's motion for stay of mandate (m-23)	

DATE	FILINGS — PROCEEDINGS	Filed
(G) 8-25-76	4 — Petitioners' opposition to further motions to stay mandate of Nuclear Regulatory Commission and Consumers Power Company (m-24)	
(K) 8-31-76	Per Curiam order that petitioners' amended joint motion to extend time to file bill of costs is granted and the time within which they may file their bill of costs is extended for a period of 10 days after entry of orders ruling upon any petitions for rehearing and/or suggestions for rehearing en banc in these cases or for a period not to exceed 10 days after the date of this order in the event no such petitioners or suggestions are filed; CJ Bazelon; Fahy, Senior CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(G) 9-1-76	4 — Respondents' reply to opposition to motion for stay of mandate (m-31)	
(G) 9-1-76	4 — Intervenor's (Consumers Power Co.) reply to opposition to motion for stay of mandate (m-1)	
(R) 9-2-76	Per Curiam order that the motions of respondents and intervenor for stay of mandate are denied; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
9-3-76	Certified copy of opinion and judgment issued to the NRC.	
(G) 9-10-76	4 — Petitioners' consolidated bill of costs (m-8)	
(C) 10-15-76	Copy of letter from Clerk, Supreme Court extending time to file petition for writ of certiorari in No. A-285 to Nov. 18	
(C) 10-20-76	Notice from Supreme Court that petition for certiorari was filed in SC No. 76-528 on Oct. 15	

[No. 73-1867]

(S) 8-9-73	4 — Petitioners' petition for review of an order of the AEC (m-6)	
(S) 8-9-73	Certified copy of Petitioners' petition for review of an order of the AEC mailed to the AEC and the US Attorney General	
(S) 8-13-73	4 — Motion of Consumers Power Co., for leave to intervene (m-10)	

DATE	FILINGS — PROCEEDINGS	Filed
(M) 8-17-73	Certified Index to Record (n-2)	
(M) 9-7-73	Clerk's order directing Clerk to file the motion by The Dow Chemical Company for leave to intervene herein; the motion for leave to intervene is granted and counsel for the intervenor may participate in oral argument only to the extent allowable under Rule 12 of the General Rules of this Court	
(M) 9-7-73	4 — Notice of intervention and motion for leave to intervene of the Dow Chemical Co. granted	
(B) 9-7-73	Clerk's order granting motion by Consumers Power Company, a Michigan Corporation, for leave to intervene; Counsel for intervenor may participate in oral argument only to the extent allowable under Rule 12 (c) of the General Rules of this Court	
(B) 9-7-73	4 — Petitioner's opposition to motion for leave to intervene of Dow Chemical Company (m-7)	
(G) 9-24-73	4 — Petitioners' motion for leave to file motion to extend time to file brief and appendix (m-20)	
(B) 9-28-73	4 — Response of intervenor Consumers Power Company in opposition to motion to dispense with filing appendix (m-28)	
(B) 9-28-73	4 — Motion of intervenor Consumers Power Company to proceed under Rule 30 (c) of FRAP (m-28)	
(G) 10-1-73	4 — Intervenor's (Dow Chemical Company) response to motion for extension of time to file brief and to dispense with filing of appendix (m-28)	
(B) 10-10-73	Order per CJ Bazelon directing Clerk to file petitioners' motion to extend time to file brief and appendix and time for filing is extended to October 29th; further ordered motion for leave to proceed under provisions of Rule 30 (c) of FRAP is granted denying motion to dispense with filing of appendix without prejudice to its being renewed after the exchange of designations and the filing of briefs as provided under Rule 30 of the FRAP; in lieu of submitting one copy of the typewritten or page proof brief provided under Rule 30 (c) of the FRAP, counsel for the parties shall submit seven copies thereof for filing	

DATE	FILINGS — PROCEEDINGS	Filed
(B) 10-10-73	4 — Petitioners' motion to extend time to file brief and appendix — granted	
(G) 10-29-73	4 — Petitioners' motion for leave to file motion to extend time to file brief (m-26)	
(G) 10-30-73	4 — Motion of Consumers Power Company to extend time to file brief to January 15, 1974 (m-29)	
(G) 11-1-73	4 — Intervenor's (Dow Chemical Co.) response to petitioners' motion to extend time to file brief (m-30)	
(B) 11-2-73	Clerk's order granting motion of Consumers Power Company, Intervenor, to extend time to file brief to January 15, 1974	
(M) 11-14-73	Order per CJ Bazelon directing the clerk to file petitioners' motion to extend time to file brief in this case; time for filing petitioners' brief in this case is extended to November 30th; sua sponte, that nos. 73-1776 and 73-1867 are consolidated for all purposes; intervenor (The Dow Chemical Co) may file its brief on the same date respondents' briefs are due to be filed in the consolidated cases	
(M) 11-14-73	4 — Petitioners' motion to extend time to file brief — granted	
(S) 11-19-73	4 — Respondent's motion to file single brief for both consolidated cases simultaneously (m-16)	
(G) 11-23-73	4 — Petitioners' motion for leave to file motion to extend time to file brief (m-20)	
(G) 11-27-73	4 — Intervenor's (Consumers Power) opposition to motion of petitioners to extend time to file brief (m-27)	
(G) 11-27-73	4 — Respondents' response to petitioners motion for extension of time to file brief (m-26)	
(G) 11-30-73	4 — Petitioners' reply to intervenors opposition to motion for extension of time and reply to respondents response to motion to extend time (m-28)	
(I) 12-27-73	4 — Respondents' motion for leave to file memorandum and order (m-26)	
(I) 12-4-73	4 — Respondents' motion for leave to file copy of order to show cause (m-4)	
(I) 1-3-74	4 — Motion of Consumers Power Co., to file a single brief (m-2)	

DATE	FILINGS — PROCEEDINGS	Filed
(B) 1-9-74	Clerk's order granting motion of intervenor Consumers Power Co., to file a single brief and time for filing intervenor's brief is extended to 30 days from the date petitioner's brief is filed in no. 73-1867	
(M) 1-11-74	Per Curiam order directing the Clerk to file the motion by petitioners in No. 73-1867 to extend time to file brief; granting petitioners' motion in no. 73-1776 for leave to file brief; counsel for respondent in the consolidated cases shall file with the Court by January 26th either a notice of its decision declining to reopen the proceedings, or a motion to remand the cases for further proceedings in the event it is inclined to grante the motion to reopen the proceeding filed with respondent by Petitioners in 73-1867; in the event the respondent declines to grant the motion to reopen the proceedings, petitioners in 73-1867 shall have 15 days from the date of that decision in which to file their brief and respondent may file a single brief for both cases which shall be due within 30 days from the date of service of petitioners' brief in 73-1867; petitioners' in the consolidated cases are granted leave to proceed under Rule 30 (c) of the FRAP, and the parties are encourged to agree as to the contents of the appendix; the Clerk is directed to file the memorandum and order submitted by respondent; Wright and Robinson, CJ	
(M) 1-11-74	4 — Petitioners' motion to extend time to file petitioners' brief — granted	
(M) 1-11-74	4 — Memorandum and Order submitted by Respondent (m-20)	
(1) 1-25-74	4 — Respondents' decision declining to reopen administrative proceedings (m-24)	
(G) 2-11-74	4 — Petitioners' motion for leave to file motion to extend time to file brief (m-6)	
(B) 2-14-74	Clerk's order granting petitioners' motion for leave to file motion to extend time to file brief; and extending time to February 25th	
(B) 2-14-74	4 — Petitioners' motion to extend time to file brief — granted	
(L) 2-21-74	4 — Respondent's motion for leave to file Supplemental Index (m-20)	

DATE	FILINGS — PROCEEDINGS	Filed
(G) 2-27-74	25 — Petitioners' brief (m-25)	
(L) 3-8-74	4 — Motion of Dow Chemical Company for leave to withdraw as Intervenor (m-7)	
(B) 3-12-74	Order per CJ Bazelon granting respondent's motion for leave to file supplemental index to record and copies of two Commission Memorandums and Orders of the aforesaid date	
(B) 3-12-74	Supplemental certified index to record	
(B) 3-12-74	2 — Order to show cause	
(L) 3-21-74	4 — Intervenor's (Consumers Power Company) motion to extend the time to file brief to May 1st (m-21)	
(L) 3-22-74	4 — Respondents' consent motion to extend the time to file brief to May 1st (m-21)	
(M) 3-25-74	Order per CJ Bazelon granting motion for the Dow Chemical Co., for leave to withdraw as an intervenor and the Clerk is directed to make the appropraite notations in the records of his office to reflect this action	
(M) 3-27-74	Clerk's order granting motion to extend time to file brief of respondent and of the Intervenor, Consumer Power Co., and the time for filing briefs by respondent and intervenor is extended to May 1, 1974	
(G) 4-3-74	4 — Motion of The State of Kansas, for leave to file brief as amicus curiae beyond time allowed petitioners in this case (m-29)	
(M) 4-19-74	Clerk's order granting motion of the State of Kansas for leave to file brief as amicus Curiae beyond time allowed petitioners in this case and the Clerk is directed to file the brief as amicus curiae	
(M) 4-19-74	25 — Brief ameiuse curiae for State of Kansas (m-29)	
(L) 5-1-74	7 — Intervenor's (Consumer Power Company) Brief (m-1)	
(L) 5-3-74	7 — Respondent's Brief (m-1)	
(L) 5-10-74	4 — Respondent's motion for leave to file supplemental index to record (m-9)	

DATE	FILINGS — PROCEEDINGS	Filed
(G) 5-17-74	4 — Petitioners' motion for leave to file motion to extend time to file a reply brief (m-15)	
(B) 5-23-74	Clerk's order granting petitioner's motion for leave to file motion to extend time to file reply brief; and extending time to May 20th	
(B) 5-23-74	4 — Petitioner's motion to extend time to file reply brief — granted	
(G) 5-22-74	4 — Petitioners' motion for leave to file motion to extend time to file reply brief (m-20)	
(G) 5-22-74	4 — Petitioners' renewed motion to dispense with filing of the appendix (m-20)	
(G) 5-24-74	4 — Intervenor's (Consumers Power Co.) response to renewed motion to dispense with filing of the appendix (m-24)	
(G) 5-28-74	4 — Respondents' opposition to motion to dispense with filing of the appendix (m-23)	
(G) 5-28-74	4 — Petitioners' motion for leave to file reply brief in excess of 35 pages (m-26)	
(G) 5-28-74	4 — Petitioners' motion for leave to file reply brief, time having expired (m-26)	
(M) 5-30-74	Clerk's order granting respondents motion for leave to file supplemental index to record	
(M) 5-30-74	Supplemental certified index to record (n-5),	
(B) 5-31-74	Clerk's order granting petitioners' motion for leave to file motion to extend time to file reply brief; and extending time to May 24th	
(B) 5-31-74	4 — Petitioners' motion for leave to extend time to file brief — granted	
(B) 5-31-74	Clerk's order granting petitioners' motion to file reply brief, time having expired	
(B) 6-17-74	Per Curiam order denying petitioner's motion for leave to file reply brief in excess of page limitations; further ordered by the Court, denying petitioner's motion to dispense with appendix; Tamm and Leventhal, CJ	
(G) 6-21-74	4 — Petitioners' motion for leave to file reply brief, time having expired (m-20)	

DATE	FILINGS — PROCEEDINGS	Filed
(M) 6-27-74	Clerk's order granting petitioners' motion for leave to file reply brief, time having expired and the Clerk is directed to file petitioners reply brief	
(M) 6-27-74	25 — Petitioners' reply brief (m-20)	
(G) 8-23-74	4 — Petitioners' motion for leave to file joint appendix instanter (m-22)	
(M) 9-3-74	Clerk's order granting petitioners' motion for leave to file joint appendix and the Clerk is directed to file petitioners' joinnt appendix	
(M) 9-3-74	7 — Joint Appendix vols. I, II, III, IV, V and VA	
(L) 9-6-74	25 — Respondent's Brief (m-29)	
(L) 9-9-74	25 — Intervenor's (Consumer Power Co.) Brief (m-9)	
(G) 10-3-74	4 — Respondents' motion for leave to file a copy of an initial decision of the Atomic Safety and Licensing Board dated September 25, 1974 (m-1)	
(L) 10-8-74	4 — Petitioners' motion for leave to file a copy of the petition for reconsideration of initial decision of the Atomic Safety and Licensing Board dated Sept. 25, 1974 (m-30)	
(M) 11-27-74	Argued before C J Bazelon and Fahy, Sr. CJ and William Wayne Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(R) 10-18-74	Clerk's order directing the Clerk to lodge all copies of the documents	
(R) 10-18-74	4 — Document entitled Petition for reconsideration of an Initial Decision of the A.S.L.B. — LODGED	
(R) 4-8-75	Per Curiam order sua sponte, that these cases are hereby held in abeyance pending the decision of this Court in Natural Resources Defense Council, Inc., et al v. United States Nuclear Regulatory Commission, et al no. 74-1586 which will be scheduled for argument on the merits during the May-June sitting period; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
	7-21-76 Opinion for the Court filed by Chief Judge Bazelon.	
	7-21-76 Judgment remanding case to the Nuclear Regulatory Commission. (n)	

DATE	FILINGS — PROCEEDINGS	Filed
(C) 8-2-76	4 — Intervenor's motion to extend time to file petition for rehearing and/or suggestion for rehearing to Aug. 25 (m-2)	
(H) 8-3-76	4 — Petitioners' motion to extend time to file bill of costs (m-2)	
(H) 8-3-76	4 — Respondents' motion to extend time to file petition for rehearing and/or suggestion for rehearing en banc to August 25, 1976 (m-2)	
(C) 8-4-76	4 — Petitioners' opposition to intervenor's motion to extend time to file petition for rehearing (m-2)	
(G) 8-11-76	4 — Intervenor's (Consumers Power Company) motion to stay issuance of mandate (m-11)	
(C) 8-11-76	4 — Respondents' motion for stay of mandate (m-11)	
(C) 8-11-76	4 — Intervenor's (Consumers Power Co.) motion to stay issuance of mandate (m-11)	
(H) 8-18-76	4 — Petitioners' motion to extend time to file bill of costs (m-17)	
(R) 8-18-76	Per Curiam order that the motions of respondent-intervenor Consumers Power Co. and of respondents NRC and USA to stay issuance of the mandate during the pendency of their motions to extend the time within which they may file petitions for rehearing are granted; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(R) 8-18-76	Per Curiam order that the motions of respondent-intervenor Consumers Power Co. and of respondents NRC and USA to extend the time within which to file their respective petitions for rehearing and suggestions for rehearing en banc to August 25th are granted; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation.	
(R) 8-18-76	Per Curiam order that petitioners' motion to extend time within which to file their bill of costs is granted; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(C) 8-23-76	4 — Respondents' motion for stay of mandate (m-20)	

DATE	FILINGS — PROCEEDINGS	Filed
(C) 8-23-76	4 — Intervenor's motion for stay of mandate (m-23)	
(G) 8-25-76	4 — Petitioners' opposition to further motions to stay mandate of Nuclear Regulatory Commission and Consumers Power Company (m-24)	
(K) 8-31-76	Per Curiam order that petitioners' amended joint motion to extend time to file bill of costs is granted and the time within which they may file their bill of costs is extended for a period of 10 days after entry of orders ruling upon any petitioners for rehearing and/or suggestions for rehearing en banc in these cases or for a period not to exceed 10 days after the date of this order in the event no such petitioners or suggestions are filed; CJ Bazelon; Fahy, Senior CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
(G) 9-1-76	4 — Respondents' reply to opposition to motion for stay of mandate (m-31)	
(G) 9-1-76	4 — Intervenor's (Consumers Power Co.) reply to opposition to motion for stay of mandate (m-1)	
(R) 9-2-76	Per Curiam order that the motions of respondent and intervenor for stay of mandate are denied; CJ Bazelon; Fahy, Sr. CJ and Justice, U.S. District Judge for the Eastern District of Texas, sitting by designation	
9-3-76	Certified copy of judgment and opinion issued to NRC.	
(C) 9-10-76	4 — Petitioners' consolidated bill of costs (m-8)	
(C) 10-15-76	Copy of letter from Clerk, Supreme Court extending time to file petition for writ of certiorari in No. A-285 to Nov. 18	
(C) 10-20-76	Notice from Supreme Court that petition for certiorari was filed in SC No. 76-528 on Oct. 15	

Notice: This opinion is subject to formal revision before publication in the Federal Reporter or U.S. App. D.C. Reports. Users are requested to notify the Clerk of any formal errors in order that corrections may be made before the bound volumes go to press.

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 74-1385

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL, PETITIONER

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION AND UNITED STATES OF AMERICA, RESPONDENTS

VERMONT YANKEE NUCLEAR POWER CORPORATION, INTERVENOR

No. 74-1586

NATURAL RESOURCES DEFENSE COUNCIL, INC., AND CONSOLIDATED NATIONAL INTERVENORS, PETITIONERS

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION AND UNITED STATES OF AMERICA, RESPONDENTS

BALTIMORE GAS AND ELECTRIC CO., ET AL., INTERVENORS

Petition for Review of an Order of the Nuclear Regulatory Commission

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Argued May 27, 1975

Decided July 21, 1976

George W. Mayo, Jr., with whom *Robert M. Jeffers*, *David J. Hensler*, *Patrick M. Raher*, *Richard E. Ayres* and *Anthony Z. Roisman*, were on the brief for petitioners in No. 74-1385.

David Hensler and *Patrick M. Raher*, with whom *Robert M. Jeffers*, *George W. Mayo, Jr.*, *Richard E. Ayres* and *Anthony Z. Roisman*, were on the brief for petitioners in No. 74-1586.

James A. Glasgow, Attorney, U.S. Nuclear Regulatory Commission, with whom *Wallace H. Johnson*, Assistant Attorney General, *Edmund B. Clark*, *John J. Zimmerman*, Attorneys, Department of Justice, *Raymond M. Zimmet*, Acting Solicitor, U.S. Nuclear Regulatory Commission, were on the brief for respondents. *Marcus A. Rowden*, *Jerome Nelson*, *Joseph DiStefono* and *Guy H. Cunningham, III*, Attorneys, U.S. Nuclear Regulatory Commission and *George R. Hyde* and *Edward J. Shawaker*, Attorneys, Department of Justice, also entered appearances for respondents.

George C. Freeman, Jr., with whom *W. Taylor Reveley, III*, *David S. Brollier* and *F. Case Whitlemore* were on the brief for intervenor, Baltimore Gas and Electric Company in No. 74-1586.

Thomas G. Dignan, Jr., for intervenor, Vermont Yankee Nuclear Power Corporation in No. 74-1385.

Louis J. Lefkowitz, Attorney, General of the State of New York and *John F. Shea, III*, Assistant Attorney General of the State of New York filed a brief on behalf of the State of New York as *amicus curiae*.

Arvin E. Upton, *Harry H. Voight* and *Eugene R. Fidell*, Filed a brief on behalf of Commonwealth Edison Company, Consolidated Edison Company of New York, Inc., Niagara Mohawk Power Corporation, Omaha Public Power District Powers Authority of the State of New

York and Rochester Gas and Electric Corp., as *amici curiae* urging affirmance.

Before: BAZELON, *Chief Judge*, EDWARDS,* *Circuit Judge* for the Sixth Circuit and TAMM, *Circuit Judge*

Opinion for the Court filed by *Chief Judge* BAZELON.

Separate statement of *Chief Judge* BAZELON.

Separate statement filed by *Circuit Judge* TAMM, concurring in the result.

BAZELON, *C.J.*: The problems posed in both these cases relate to the manner and extent to which information concerning the environmental effects of radioactive wastes must be considered on the public record in decisions to license nuclear reactors.

I. INTRODUCTION

Appeal number 74-1385 involves a proceeding to license a specific nuclear reactor (the Vermont Yankee Nuclear Power Station located near Vernon, Vermont). Pursuant to the National Environmental Policy Act,[1] petitioners[2]

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* Sitting by designation pursuant to 28 U.S.C. § 291(a).

[1] 42 U.S.C. § 4321, *et seq.* (1970) (hereafter "NEPA").

[2] Petitioners in 74-1385 are the Natural Resources Defense Council, Inc. ("NRDC") and the New England Coalition on Nuclear Pollution, Inc., voluntary organizations supported by contributions from individual members, which intervened in the licensing proceedings.

NRDC is also a petitioner in 74-1586, where it is joined by Consolidated National Intervenors, Inc. ("CNI"), a coalition of almost eighty public interest groups and individuals which actively participated in the rule making proceedings. Several groups such as the Sierra Club and the Union of Concerned Scientists which are members of CNI also made individual presentations.

[Continued]

sought consideration of the environmental effects of that portion of the "nuclear fuel cycle" [3] attributable to operation of that reactor. The Appeal Board held that Licensing Boards [4] must consider the environmental effects of trans-

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Since on all but a few issues these groups adopted the same positions, for convenience they are referred to collectively as "public interest intervenors" in order to distinguish them from a group of 14 utility companies which also actively participated in the rulemaking. One member of that group, Baltimore Gas & Electric Co., has also intervened in the proceedings in this court.

[3] The "nuclear fuel cycle" is that chain of activities beginning with mining of uranium ore and extending through final reprocessing and disposal of radioactive wastes by which fuel for a nuclear reactor is processed. Most of these events take place off the individual reactor site, but are necessary to its continued operation.

Although the nuclear fuel cycle encompasses numerous stages, these cases are concerned almost exclusively with the reprocessing and disposal of wastes which the public interest intervenors contend account for by far the largest portion of the environmental impact of the fuel cycle.

The word *disposal* may itself be misleading, for it connotes some physical or chemical step which renders the wastes less toxic. Under present technology, the only known agent of detoxification is the passage of great amounts of time. The phase of the nuclear fuel cycle referred to as "disposal" generally refers only to storage of wastes in physical isolation.

[4] Licensing of commercial nuclear reactors embraces two separate proceedings—the first to determine whether the facility should be constructed; the second to determine whether it should be licensed to operate. *See generally*, Power Reactor Development Corp. v. I.U.E.W., 367 U.S. 396 (1961).

Proceedings are conducted before a three-member Atomic Safety and Licensing Board, 42 U.S.C. § 2241, which is the counterpart of an Administrative Law Judge in other agencies. The Licensing Board is typically composed of two nuclear physicists and one lawyer who serves as chairman.

[Continued]

portation of fuel to a reactor and of wastes to reprocessing plants, but need not consider the "operations of the reprocessing plants or the disposal of wastes" in individual licensing proceedings. *In re Vermont Yankee Nuclear Power Corp.*, ALAB-56, 4 AEC 930 (June 6, 1972), I-J.A. 72, 76.[5]

Appeal number 74-1586 involves a rulemaking proceeding which the Commission instituted shortly thereafter with specific reference to the *Vermont Yankee* decision. The purpose of the rulemaking was to reconsider whether environmental effects of all stages of the uranium fuel cycle should be included in the cost-benefit analysis for licensing individual reactors. 37 Fed.Reg. 24191 (Nov. 15, 1972), II-J.A. 1. The Commission concluded the environmental effects of the fuel cycle, including waste disposal, were "relatively insignificant,"[6] but that it was preferrable to take them into account. Therefore, a rule was promulgated requiring a series of specified numerical values (set out as Table S-3 accompanying the rule) be factored into the cost-benefit analysis

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The Atomic Energy Commission ("AEC") has delegated its review functions over Licensing Board decisions to Atomic Safety and Licensing Appeal Boards, subject to discretionary determination by the AEC itself of "major or novel questions of policy, law or procedure." 10 C.F.R. § 2.785(a); *id.* (d)(1).

The AEC was abolished by the Energy Reorganization Act of 1974, 88 Stat. 1233 *et seq.*, and its functions divided between the United States Nuclear Regulatory Commission (NRC), which has been substituted as formal respondent by order of this court, and the Energy Research and Development Agency (ERDA). For consistency, the terminology AEC or "the Commission" is used throughout.

[5] References to the joint appendix in 74-1385 are in the form "I-J.A." Both volumes of the appendix in 74-1586 are referred to as "II-J.A."

[6] *See infra* note 19.

for an individual reactor. These values are intended to represent the incremental contribution of an additional reactor to the environmental effect of the fuel cycle. The rule further provides that in addition to Table S-3, "No further discussion of such environmental effects shall be required."[7] Finally, it is declared that "[i]nsofar as this rule differs" from that announced in the *Vermont Yankee* decision, *supra*, that decision shall have "no further precedential significance." *Id.*

II. Vermont Yankee (74-1385)

It is undisputed that a reactor licensing is a "major Federal action[] significantly affecting the quality of the human environment" which requires a "detailed" environmental impact statement under § 102(2)(C) of NEPA, 42 U.S.C. § 4332(2)(C). That section requires an impact statement to consider, *inter alia*,

> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> * * * *
>
> (v) any irreversible and irretriveable commitments of resources which would be involved in the proposed action should it be implemented.

The plain meaning of this language encompasses radioactive wastes generated by the operations of a nuclear power station, just as it does the stack gases produced by a coal-burning power plant.

Nor are the wastes generated by the subject reactor *de minimis*. We were informed at argument that the Vermont Yankee plant will produce approximately 160 pounds of plutonium wastes annually during its 40-year

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[7] 39 Fed.Reg. 14188, 14191 (April 22, 1974), II-J.A. 507, 509. The rule is codified as Part 51.20(e) of 10 C.F.R. (1975) in a section entitled "Applicant's Environmental Report—Construction Permit Stage."

life span.[8] Plutonium is generally accepted as among the most toxic substances known; inhalation of a single microscopic particle is thought to be sufficient to cause cancer.[9] Moreover, with a half-life of 25,000 years, plutonium must be isolated from the environment for 250,000 years before it becomes harmless. Operation of the facility in question will also produce substantial quantities of other "high-level" [10] radioactive wastes in the form of stron-

[8] There has been some disagreement between the parties concerning the exact amounts of wastes to be produced. We are required to consider projects from the perspective of their potential effect on the "quality of the human environment." 42 U.S.C. § 4332(2)(C). Since plutonium and other high level wastes may be toxic in extremely small quantities, these variances are not of an order which would affect our conclusions.

[9] *See* Luschbauch & Langham, *A Dermal Lesion from Implanted Plutonium*, 86 ARCHIVES OF DERMATOLOGY at 121-24 (Oct. 1962).

The dangers of plutonium must be kept in perspective. Certain industrial chemicals and substances common in laboratories may be equally toxic. B. Cohen, *Environmental Hazards in High-Level Radioactive Waste Disposal*, 2 (unpublished). Recent theoretical calculations suggest many would survive even intentional dispersal of plutonium over a city. B. Cohen, *The Hazards in Plutonium Dispersal*, Institute for Energy Analysis, Oak Ridge, Tenn. (1975). *See also* Bethe, *The Necessity of Fission Power*, 234 SCIENTIFIC AMERICAN 21, 29 (1976).

[10] According to a pamphlet published by the AEC's office of Information to inform the general public, "high-level" wastes consist primarily of highly radioactive spent reactor fuel containing "several hundred to several thousand curies per gallon in liquid form . . . ." Fox, *Radioactive Waste*, AEC No. IB-508, 14-15 (rev. ed. 1969). They "pose the most severe potential health hazard and the most complex technical problems in management," *id.*, and thus attracted the bulk of the attention in these proceedings.

Less radioactive "low-level" wastes are also produced, primarily when objects such as pipes, rags or other debris are exposed to radioactivity produced in the reactor core. Low-

tium-90 and cesium-137 which, with their shorter, 30-year half-lives, must be isolated from the environment for "only" 600 to 1000 years.[11]

The Appeal Board advanced two major arguments to justify its decision that reprocessing and waste disposal issues need not be considered at the licensing stage: (1) that these issues are too speculative; and (2) that they are more appropriately considered when reprocessing and waste disposal facilities are themselves licensed. We turn now to these contentions.

The Board agreed that "there will be an incremental environmental effect ultimately resulting from the operation of this reactor as the result of the operation of whatever reprocessing and disposal grounds may from time to time be used during the life of the plant." [12] In its opin-

level wastes have long been disposed of in commercial burial grounds and were thought not to constitute a major problem. Recently, however, EPA and GAO have publicly reported radioactive material has been "migrating" from such facilities at a rate "much more rapid than scientists thought possible." *See* "New Alarms About Old Nuclear Wastes," BUSINESS WEEK (Feb. 2, 1976) at 17; "GAO Reports New Nuclear Garbage Problem," 6 SCIENCE & GOV. RPT. 8 (Feb. 1, 1976).

[11] The general outlines of the high-level waste disposal problem are undisputed. In Scientists' Institute for Public Information, Inc. v. AEC (*"SIPI"*), 156 U.S.App.D.C. 395, 481 F.2d 1079, 1098 (1973), this court observed:

> These wastes will pose an admitted hazard to human health for hundreds of years, and will have to be maintained in special repositories. *The environmental problems attendant upon processing, transporting and storing these wastes . . . warrant the most searching scrutiny under NEPA.* [Emphasis added.]

[12] I-J.A. 80. We note at the outset that this standard is misleading because the toxic life of the wastes under discussion far exceeds the life of the plant being licensed. The

ion, however, these effects were too "contingent and presently indefinable" to be evaluated at the time of licensing in view of the 40-year expected life of the reactor. The Board wrote:

> It is evident to us that evaluation of the environmental effects of the operation of one or more unidentifiable reprocessing plants, employing separation processes which are unidentified and which may or may not now be known or used, during the course of the forty-year life of the plant, is not possible at this time and in this proceeding.

I-J.A. 82. This approach was decisively rejected in *SIPI*, supra, note 11, 481 F.2d at 1092. There we held that the obligation to make reasonable forecasts of the future is implicit in NEPA and therefore an agency cannot "shirk [its] responsibilities under NEPA by labeling any and all discussion of future environmental effects as 'crystal ball inquiry.'" "Meaningful information" concerning the effects of waste reprocessing and disposal technology is presently available, *see SIPI*, 481 F.2d at 1094, 1096. As the Board noted, a reprocessing plant has been operated by the Commission for some time, and additional plants are under construction. I-J.A. 79. The possibility that

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environmental effects to be considered are those flowing from reprocessing and passive storage for the full detoxification period.

It is also misleading to focus solely on the *incremental* impact of the waste generated by an additional reactor. *See* NRDC v. Callaway, 524 F.2d 79, 88 (2d Cir. 1975):

> [A]n agency may not . . . treat[] a project as an isolated "single-shot" venture in the face of persuasive evidence that it is but one of several substantially similar operations. . . . To ignore the prospective cumulative harm under such circumstances could be to risk ecological disaster.

See also Kleppe v. Sierra Club, 44 U.S.L.W. 5104, 5109 (U.S., June 28, 1976) (Comprehensive EIS should address cumulative impact of proposals "pending concurrently"); *cf. id.* at 5111 n.26.

improved technology may be developed during the 40-year life span of a reactor does not render consideration of environmental issues too speculative, as the Board appears to suggest. NEPA's requirement for forecasting environmental consequences far into the future implies the need for predictions based on existing technology and those developments which can be extrapolated from it.[18]

As more and more reactors producing more and more waste are brought into being, "irretrievable commitments [are] being made and options precluded," *see SIPI*, 481 F.2d at 1094, 1098, and the agency must predict the environmental consequences of its decisions as it makes them. *See Aberdeen & Rockfish R.R. v. SCRAP*, 422 U.S. 289, 320 (1975).

The second argument advanced by the Board is that licensing proceedings for reprocessing plants are a more "appropriate proceeding" in which to weigh the environmental effects of reprocessing and waste disposal. I-J.A. 86. Licensing of a reprocessing plant or waste disposal facility is itself a "major Federal action" affecting the environment which requires a NEPA statement. The real question posed by the Board's opinion is whether the environmental effects of the wastes produced by a

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[18] Technical breakthroughs not now foreseen may of course render these assumptions too conservative, and environmental costs may turn out to be less than expected. The alternative is to rest on a blind faith in technological progress. This the draftsmen of NEPA were quite evidently unwilling to do.

Conversely, unforeseen problems sometimes crop up to forestall anticipated technological solutions. *See, e.g., infra* notes 46 & 47. Where important changes in the state of the art or other major uncertainties are in the offing, meaningful assessments of future environmental impacts might be facilitated by making two alternative estimates: one based only on existing technology and another which takes into account developments which may reasonably be anticipated. We have no occasion in this case to decide whether a court could ever require such a procedure.

nuclear reactor may be ignored in deciding whether to build it because they will later be considered when a plant is proposed to deal with them. To answer this question any way but in the negative would be to misconstrue the fundamental purpose of NEPA.[14] Once a series of reactors is operating, it is too late to consider whether the wastes they generate should have been produced, no matter how costly and impractical reprocessing and waste disposal turn out to be; all that remain are engineering details to make the best of the situation which has been created.[15] NEPA's purpose was to break the cycle of such incremental decision-making:

[14] *Cf.* Calvert Cliffs' Coordinating Comm. v. AEC, 449 F.2d 1109, 1128 (D.C.Cir. 1971). There the Commission proposed to forestall consideration of environmental issues in granting reactor construction permits until an operating license was issued. This court pointed out: "Once a facility has been completely constructed, the economic cost of any alteration may be very great . . . . By refusing to consider requirement of alterations until construction is completed, the Commission may effectively foreclose the environmental protection desired by Congress."

[15] Intervenor Baltimore Gas & Electric Co. contended at argument "however broad NEPA may be, it does not require agencies like the AEC, ICC or CAB to examine in the impact statement the very reason for being of that agency." We have already rejected that argument in Natural Resources Defense Council v. Morton, 458 F.2d 827, 836 (D.C.Cir. 1972): "The need for continuing review of environmental impact of alternatives under NEPA cannot be put to one side on the ground of past determinations by Congress or the President." *See also* Calvert Cliffs' Coordinating Comm. v. AEC, *supra* note 14, 449 F.2d at 1127. One function of NEPA is to provide systematic feedback to Congress and the public on the environmental costs of implementing programs so that they may be re-evaluated in the light of experience.

Moreover, the "reason for being" of the agencies administering the Atomic Energy Act of 1954 has never been unlimited development of civilian nuclear power without re-

> Policy is established by default and inaction. Environmental problems are only dealt with when they reach crisis proportion . . . . Important decisions concerning the use and shape of man's environment continue to be made in small but steady increments which perpetuate rather than avoid the recognized mistakes of previous decades.

Senate Rep. No. 296, 91st Cong., 1st Sess. 5 (1969). Decisions to license nuclear reactors which generate large amounts of toxic wastes requiring special isolation from the environment for several centuries are a paradigm of "irreversible and irretrievable commitments of resources" which must receive "detailed" analysis under § 102(2)(C)(v) of NEPA, 42 U.S.C. § 4332(2)(C)(v).[16] We therefore hold that absent effective generic proceedings to consider these issues, they must be dealt with in individual licensing proceedings.[17]

gard to the costs or risks. The Congressionally declared purpose is only to "encourage widespread participation in the development and utilization of atomic energy for peaceful purposes *to the maximum extent consistent with . . . the health and safety of the public.*" 42 U.S.C. § 2013(d) (1970) [emphasis added].

[16] No one suggests that the two sentence statement in the Vermont Yankee Final Environmental Impact Statement is adequate to satisfy § 102(2)(c). It reads:

> Long-lived radioactive materials will be produced by fission of nuclear fuel in the core of the reactor and neutron activation of reactor parts near the core. The eventual disposal and storage of radioactive materials will require a certain amount of space, probably in an area remote from this plant, for a very long period of time, and could for all practical purposes be considered as an irreversible commitment of resources.

I-J.A. 263.

No attempt is made to estimate the quantity of wastes produced, describe what precautions must be taken, or assess the costs and risks involved.

[17] When the final full-power, full-term operating license for the Vermont Yankee Nuclear Power Station was issued, the

The order granting a full-term license for the Vermont Yankee plant is hereby remanded to await the outcome of further proceedings in the rulemaking, discussed hereafter.

III. RULEMAKING (74-1586)

(A.)

The notice of proposed rulemaking, 37 Fed.Reg. 24191 (Nov. 15, 1972), suggested as a possible alternative to the rule of *Vermont Yankee, supra*, that a series of specified numerical values (set out as Table S-3 in the notice) be factored into the cost-benefit analysis for individual

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Appeal Board "declined to re-examine" its earlier holdings that reprocessing and waste disposal issues need not be considered, since the rulemaking proceeding was then pending. I-J.A. 495-96. As a result, the Government argues the only issue raised is "whether the Commission under the National Environmental Policy Act (NEPA) could deal with fuel cycle issues by rulemaking, instead of in the context of numerous separate adjudications, such as the Vermont Yankee licensing proceeding." Respondent's brief at 5.

No one questions the AEC's power to do so in this proceeding. *Cf.* Union of Concerned Scientists v. AEC, 499 F.2d 1069 (D.C.Cir. 1974). Nor do we doubt that generic proceedings are a more efficient forum in which to develop these issues without needless repetition and potential for delay. *See* Ecology Action v. AEC, 492 F.2d 998, 1002 (2d Cir. 1974) (Friendly, J.) (dictum); Note, "The Use of Generic Rulemaking to Resolve Environmental Issues in Nuclear Power Plant Licensing," 61 VA.L.REV. 869, 878-79 (1975). However, the decision to hold generic proceedings rather than to leave these issues for individual licensings is left to agency discretion. *See infra* note 27.

What the agency may not do, consistent with NEPA, is to fail to give these issues adequate consideration in either forum. Thus, until an adequate generic proceeding is held (which may also consolidate a number of pending cases, *see, e.g.*, Specialized Common Carrier Services, 29 F.C.C. 870 (1971)), these issues will be ripe in individual licensing proceedings.

reactors.[18] These values were intended to represent the

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[18]

TABLE S-3.—*Summary of environmental considerations for uranium fuel cycle*

[Normalized to model LWR annual fuel requirement]

Natural resource use	Total	Maximum effect per annual fuel requirement of model 1,000 MWe LWR
Land (acres):		
Temporarily committed	68	
Undisturbed area	45	
Disturbed area	13	Equivalent to 80 MWe coal-fired powerplant.
Permanently committed	4.6	
Overburden moved (millions of MT)	2.7	Equivalent to 90 MWe coal-fired powerplant.
Water (millions of gallons):		
Discharged to air	155	≈2 percent model 1,000 MWe LWR with cooling tower.
Discharged to water bodies	11,040	
Discharged to ground	129	
Total	11,319	<4 percent of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousands of MW-hour)	317	<3 percent of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT)	115	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	93	<0.3 percent of model 1,000 MWe energy output.
Effluents—chemical (MT):		
Gases (including entrainment):[1]		
SO_x	4,400	Equivalent to emissions from 45 MWe coal-fired plant for a year.
NO_x[2]	1,177	
Hydrocarbons	13.8	
CO	28.7	
Particulates	1,154	
Other gases:		
F	.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards—below level that has effects on human health.
Liquids:		
$SO_4^=$	10.2	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constituents that require dilution and the flow of dilution water are: NH_3—600 cfs; NO_3—20 cfs; Fluoride—70 cfs
NO_3^-	26.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl^-	8.6	
Na^+	14.9	
NH_3	11.5	
[illegible]	.4	
[illegible]	[illegible]	
Tailings solutions (thousands of MT)	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—Radiological (curies):		
Gases (including entrainment):		
Rn-222	73	Principally from mills—maximum annual dose rate <4 percent of average natural background within 5 mi of mill. Results in 0.06 man-rem per annual fuel requirement.
Ra-226	.02	
Th-230	.02	
Uranium	.002	
Tritium (thousand)	16.7	Principally from fuel reprocessing plants—Whole body dose is 4 man-rem per annual fuel requirements for population within 50 mi radius. This is <0.007 percent of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/yr has been included in fission products and transuranics total.
Kr-85 (thousands)	330	
I-129	.0034	
I-131	.024	
Fission products and transuranics	1.01	
Liquids:		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production-concentration 9 percent of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Rn-222[3]	.15	From reprocessing plants—maximum concentration 4 percent of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (thousands)	2.5	
Solids (buried):		
Other than high level	601	All except 1 Ci comes from mills—included in tailings returned to ground—no significant effluent to the environment. 1 Ci from conversion and fuel fabrication is buried.
Thermal (billions)	2,980	<7 percent of model 1,000 MWe LWR.
Transportation (man-rem): Exposure of workers and general public	.334	

[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.3 percent from natural gas use and process.
[3] Co-137 (0.275 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

incremental contribution of a hypothetical 1000 MWe model light water reactor to the total environmental effect of the uranium fuel cycle. While expressed as numerical values in Table S-3, a fair summary of the conclusions incorporated into the rule is that the environmental effects of the fuel cycle are "insignificant." [19] The notice further stated that the "supporting data for this summary table" is contained in a staff document entitled the "Environmental Survey of the Nuclear Fuel Cycle" (Nov. 6, 1972) [hereafter "Environmental Survey"], which was simultaneously made public.[20]

An "informal rulemaking hearing" of the "legislative-type" was scheduled to receive comments in the form of "oral or written statements." [21] By subsequent notice, the Commission designated a three-member hearing board to preside, and reiterated, "The procedural format for the hearing will follow the legislative pattern, and no discovery or cross-examination will be utilized." 38 Fed. Reg. 49 (Jan. 3, 1973).[22]

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[19] In explaining its decision not to require Table S-3 to be applied retroactively, the Commission stated:

> In view of the fact that the environmental effects of the uranium fuel cycle have been shown to be relatively insignificant, the Commission believes that it is unnecessary to apply the [rule] to . . . environmental reports submitted prior to its effective date. . . .

39 Fed.Reg. 14190 (April 22, 1974); II-J.A. 508.

[20] 37 Fed.Reg. 24192 n.1; *id.*, 24193.

It is conceded that the Environmental Survey was not "intended to be a detailed environmental statement as defined in the National Environmental Policy Act of 1969. . . ." I-J.A. 512; 39 Fed.Reg. 14188 (April 22, 1974), II-J.A. 507.

[21] 37 Fed. Reg. 24191 (Nov. 15, 1972).

[22] It should be noted that members of the presiding hearing board were empowered to ask questions, and occasionally did. In addition, "over 100 pages of handwritten calculations" and

The primary argument advanced by the public interest intervenors is that the decision to preclude "discovery or cross-examination" denied them a meaningful opportunity to participate in the proceedings as guaranteed by due process. They do not question the Commission's authority to proceed by informal rulemaking, as opposed to adjudication. They rely instead on the line of cases indicating that in particular circumstances procedures in excess of the bare minima prescribed by the Administrative Procedure Act, 5 U.S.C. § 553, may be required.[23]

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prior drafts of the Environmental Survey were eventually placed in the public document room. 39 Fed.Reg. 14190-91 (April 22, 1974).

None of these documents, however, dealt with the crucial waste disposal issues covered by Dr. Pittman, *see infra* pp. 23-32.

[23] *See, e.g.*, Mobil Oil Corp. v. FPC, 157 U.S.App.D.C. 235, 483 F.2d 1238, 1260 (1973); International Harvester Co. v. Ruckelshaus, 155 U.S.App.D.C. 411, 478 F.2d 615, 629-31, 649 (1973); Appalachian Power Co. v. EPA, 477 F.2d 495, 503 (4th Cir. 1973); Walter Holm & Co. v. Hardin, 145 U.S.App. D.C. 347, 449 F.2d 1009, 1016 (1971); American Airlines, Inc. v. CAB, 123 U.S.App.D.C. 310, 359 F.2d 624, 632-33 (en banc), *cert. denied*, 385 U.S. 843 (1966).

See also, Williams, *"Hybrid Rulemaking" under the Administrative Procedure Act: A Legal and Empirical Analysis*, 42 U.CHI.L.REV. 401 (1975); Wright, *Court of Appeals Review of Federal Regulatory Agency Rulemaking*, 26 ADMIN. L.REV. 199 (1974); Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L.REV. 375 (1974). Verkuil, *Judicial Review of Informal Rulemaking*, 60 VA.L.REV. 185, 234-49 (1974); Note, *The Judicial Role in Defining Procedural Requirements for Agency Rulemaking*, 87 HARV.L.REV. 782 (1974); Hamilton, *Procedures for the Adoption of Rules of General Applicability: The Need for Procedural Innovation in Administrative Rulemaking*, 60 CALIF.L.REV. 1276, 1313-30 (1972); Claggett, *Informal Action —Adjudication—Rulemaking: Some Recent Developments in Federal Administrative Law*, 1971 DUKE L.J. 51, 78.

The Government concedes that "basic considerations of fairness may under exceptional circumstances" require additional procedures in "legislative-type proceedings," but contends that the procedures here were more than adequate.[24] Thus, we are called upon to decide whether the procedures provided by the agency were sufficient to ventilate the issues.[25]

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[24] Respondent's brief at 13-14.

[25] We disagree with Intervenor Baltimore Gas & Electric Co.'s threshold objection that the public interest intervenors failed to make a proffer of the specific issues and witnesses which they claimed could not adequately be explored without cross-examination as required by International Harvester Co. v. Ruckelshaus, *supra* note 23, 478 F.2d at 630-31; *see also* American Airlines v. CAB, *supra* note 23, 359 F.2d at 632-33. The public-interest intervenors submitted a thorough legal brief demanding cross-examination and discovery rights. CNI-UCS Statement with Respect to Legal Considerations of the Proposed Regulations on the Nuclear Fuel Cycle, 20-29; II-J.A. 225, 245, 254. The first point made by Mr. Roisman, attorney for the public interest intervenors, in the oral hearings was a request to be allowed to go behind the reassurances offered by Dr. Pittman:

> The Atomic Energy Commission continues to take subjects as important as nuclear waste disposal and treat them in a cavalier manner that we find them treated in this environmental survey. They continue to raise the issues of the environmental [sic] fuel cycle in the most obtuse manner, and subject it to this type of a legislative hearing, while refusing to face up to the fact that the public demands the right to cross-examine and to have discovery on these issues, that we are not satisfied with Mr. Pittman's well intentioned, but, we think, not at all well explained position with regard to the ability to handle nuclear wastes for hundreds of thousands of years. He has in his own words referred to it as a program of perpetual management . . . . I think the public deserves the right to ask the question, What does that mean?

II-J.A. 121-22. That was sufficient to focus the agency's attention on Dr. Pittman's testimony as in the category of "soft and sensitive subjects and witnesses." International Harvester, *supra*, 478 F.2d at 631. *See infra*, pp. 32-33.

To be sure, the public interest intervenors did not show that these issues could not be explored except through cross-examination; nor did they attempt such a showing. Their argument, as we understand it, is not that cross-examination was required *per se*, but that the procedures utilized by the Commission were in the aggregate inadequate sufficiently to ventilate the issues. They recognize, for example, that exploration of the underlying methodology of the Environmental Survey could have been facilitated by adequate discovery, as an alternative to cross-examination of the staff. *See* Petitioner's Brief, 13-15.

A few general observations are in order concerning the role of a court in this area. Absent extraordinary circumstances, it is not proper for a reviewing court to prescribe the procedural format which an agency must use to explore a given set of issues.[26] Unless there are statutory directives to the contrary, an agency has discretion to select procedures which it deems best to compile a record illuminating the issues.[27] Courts are no more expert at fashioning administrative procedures than they are in

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[26] The Supreme Court has recently cautioned against requiring an agency to use particular procedures on remand:

> At least in the absence of substantial justification for doing otherwise, a reviewing court may not, after determining that additional evidence is requisite for adequate review, proceed by dictating to the agency the methods, procedures, and time dimension of the needed inquiry and ordering the results to be reported to the court without opportunity for further consideration on the basis of the new evidence by the agency.

FPC v. Transcontinental Gas Pipe Line Corp., 96 S.Ct. 579, 583 (1976) (per curiam) [footnote omitted].

[27] *See* NLRB v. Bell Aerospace Co., 416 U.S. 267, 292-95 (1974); SEC v. Chenery Corp., 332 U.S. 194, 203 (1947) (Chenery II); Siegel v. AEC, 400 F.2d 778, 783 (D.C.Cir. 1968).

the substantive areas of responsibility which are left to agency discretion.[28] What a reviewing court can do, however, is scrutinize the record as a whole to insure that genuine opportunities to participate in a meaningful way were provided, and that the agency has taken a good, hard look at the major questions before it.

We have sometimes suggested that elucidation of certain types of issues, by their very nature, might require particular procedures, including cross-examination.[29] In fact, we have been more concerned with making sure that the record developed by agency procedures discloses a thorough ventilation of the issues than with what devices the agency used to create the dialogue.[30]

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[28] That may be reflected in the finding that in most cases where the right to cross-examination was won on appeal, it was not actually used on remand, the parties instead agreeing on more flexible procedures such as written memoranda explaining technical methodology or informal staff conferences which better suited their needs. *See* Williams, *supra* note 23, 42 U.CHI.L.REV. at 436-37; 448-54.

[29] *See, e.g.*, International Harvester v. Ruckelshaus, *supra* note 23, 478 F.2d at 631 ("soft and sensitive subjects and witnesses"); *but cf.* O'Donnell v. Shaffer, 160 U.S.App.D.C. 266, 491 F.2d 59, 62 (1974) (Bazelon, C.J.): "the presence of technical issues in and of itself [does not] create a need for cross-examination."

[30] *See, e.g.*, Walter Holm & Co. v. Hardin, *supra* note 23, 449 F.2d at 849: "What counts is the reality of an opportunity to submit an effective presentation, to assure that the Secretary and his assistant will take a hard look at the problems in light of those submissions."; International Harvester v. Ruckelshaus, *supra* note 23, 478 F.2d at 631: "There was a meaningful opportunity to be heard. . . . The record reveals that the hearing officers did not propound the pre-submitted questions like robots; they were charged with conducting a hearing for the purpose of focusing information needed for decision and they quite appropriately 'followed up' on questions."; O'Donnell v. Shaffer, *supra* note 23, 491 F.2d at 62: "Here the agency's proceedings provided an adequate opportunity for the airing of technical disputes. Appellants presented their evidence orally and in writing and questioned a supporter of the rule who testified at the hearing. The agency considered the evidence presented at the hearing in its 'Disposition of Petition.' On these facts, the procedures were adequate for the task at hand."; Ethyl Corp. v. EPA, No. 73-2205 (D.C.Cir., March 19, 1976) (en banc) (opinion of Wright, J.), slip op., 119-22, —— F.2d ——, ——, *cert. denied*, 44 U.S.L.W. 3719 (June 10, 1976), reviewing in detail the procedures used and the agency's lengthy opinion and concluding: "The complex scientific questions presented by this rulemaking proceeding were resolved in the crucible of debate through the clash of informed but opposing scientific and technological viewpoints." [Citation omitted.]

Of necessity, assessing agency procedures requires that the reviewing court immerse itself in the record. Abstract characterizations are an unsatisfactory guide for determining what procedures are necessary in particular proceedings.[31] Alternative procedural techniques are usually available, and the absence of one device, such as cross-examination, may be compensated for by the sensitive use

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[31] *See* Wright, *supra* note 23, 26 ADMIN.L.REV. at 206-7; *id.*, 59 CORNELL L.REV. at 387-88.

Judge Tamm professes surprise that one who believes judges must avoid making "plausible-sounding, but simplistic, judgments of the relative weight to be afforded various pieces of technical data," Ethyl Corp. v. EPA, *supra* note 30 (Bazelon, C.J., concurring), slip op., 2, nonetheless believes review of agency procedures requires conscientious attention to the state of the record. Concur, n. 7.

There is, however, a difference crucial to the institutional competency of judges between the majority opinion here and the panel opinion, joined by Judge Tamm, which was overturned by the court *en banc* in *Ethyl*. The panel in *Ethyl* took it upon itself to decide that an expert agency had made "clear errors of judgment" in evaluating conflicting scientific studies. Slip op., 48. Here we merely systematically catalog the state of the record to verify that the agency has digested and addressed the major issues.

of substitutes.[32] If review is to be meaningful, it must focus on the actual operation of the whole range of procedures in a particular setting—including "contexts of fact, statutory framework, and nature of action."[33]

A prominent feature of the statutory context created by NEPA is the requirement that the agency acknowledge and consider "responsible scientific opinion concerning possible adverse environmental effects" which is contrary to the official agency position. (*see, e.g., infra* note 51). *Committee for Nuclear Responsibility, Inc.* v. *Seaborg*, 463 F.2d 783, 787 (D.C. Cir. 1971). NEPA requires that agencies see to it that "the officials making the ultimate decision [are] informed of the full range of responsible opinion on the environmental effects in order to make an informed choice." *Id.* The decision to proceed by rulemaking neither relieves the Commission of this obligation, nor permits it to depend solely on whatever contributions intervenors happen to make to develop a fair representation of scientific opinion for the record.[34]

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[32] *See* International Harvester v. Ruckelshaus, *supra* note 23, 478 F.2d at 631.

[33] Kennecott Copper Corp. v. EPA, 149 U.S.App.D.C. 231, 235, 462 F.2d 846, 850 (1972).

[34] At least in the NEPA context, an agency has an affirmative obligation to explore the issues in depth, rather than wait passively until an intervenor takes the initiative. *See* Calvert Cliffs' Coordinating Comm. v. AEC, *supra* note 14, 449 F.2d at 1118-19. There the Commission proposed to limit consideration to environmental issues "which parties affirmatively raise." The court held that was inconsistent with NEPA's "basic mandate":

> The primary responsibility for fulfilling that mandate lies with the Commission. Its responsibility is not simply to sit back, like an umpire, and resolve adversary contentions at the hearing stage. Rather, it must take the initiative. . . .

See also Scenic Hudson Preservation Conference v. FPC, 354 F.2d 608, 620-21 (2d Cir. 1965), *cert. denied*, 384 U.S. 941 (1966) (agency duty to develop full record grounded on broad principles of administrative law); Note, *supra* note 17, 61 VA.L.REV. at 891: "when the record is deficient, the Commission may even have a duty to consider issues ignored by the parties."

In order to determine whether an agency has lived up to these responsibilities, a reviewing court must examine the record in detail to determine that a real give and take was fostered on the key issues. This does not give the court a license to judge for itself how much weight should be given particular pieces of scientific or technical data, a task for which it is singularly ill-suited. It does require, however, that the court examine the record so that it may satisfy itself that the decision was based "on a consideration of the relevant factors."[35] Where only one side of a controversial issue is developed in any detail, the agency may abuse its discretion by deciding the issues on an inadequate record.

A reviewing court must assure itself not only that a diversity of informed opinion was heard, but that it was genuinely considered. "[T]he dialogue that the APA's rulemaking section contemplates cannot be a sham."[36] Since a reviewing court is incapable of making a penetrating analysis of highly scientific or technical subject matter on its own, it must depend on the agency's ex-

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In both *Calvert Cliffs* and *Scenic Hudson*, the court pointed out that poorly-financed public interest intervenors may lack the wherewithal to marshal technical evidence and bring it to the Commission's attention. *See also* American Public Power Ass'n v. FPC, 522 F.2d 142, 147 (D.C.Cir. 1975) (Bazelon, C.J., concurring); Citizens for Safe Power v. NRC, 524 F.2d 1291, 1304 (D.C.Cir. 1975) (Bazelon, C.J., concurring).

[35] Citizens to Preserve Overton Park, Inc. v. Volpe, 401 U.S. 402, 416 (1971). *Cf.* Ethyl Corp. v. EPA, *supra* note 30 (Bazelon, C.J., concurring), slip op., 2 n.7.

[36] Wright, *supra* note 23, 26 ADMIN.L.REV. at 206.

pertise, as reflected in the statement of basis and purpose, to organize the record, to distill the major issues which were ventilated and to articulate its reasoning with regard to each of them.[37]

An agency need not respond to frivolous or repetitive comment it receives. However, where apparently significant information has been brought to its attention, or substantial issues of policy or gaps in its reasoning raised, the statement of basis and purpose must indicate why the agency decided the criticisms were invalid.[38] Boilerplate generalities brushing aside detailed criticism on the basis of agency "judgment" or "expertise" avail nothing; what is required is a reasoned response, in which the agency points to particulars in the record which, when coupled with its reservoir of expertise, support its resolution of the controversy.[39] An agency may abuse its discretion by proceeding to a decision which the record before it will not sustain, in the sense that it raises fundamental questions for which the agency has adduced no reasoned answers.

(B.)

With these observations in mind, we turn to our examination of this record. The significance of Table S-3 is that it expresses in numerical terms the conclusion that the environmental effects of the fuel cycle, including waste

[37] *See* Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 393-95 (D.C.Cir. 1973), *cert. denied*, 417 U.S. 921 (1974); *cf.* Automotive Parts & Accessories Ass'n v. Boyd, 407 F.2d 330, 338 (D.C.Cir. 1968) (statement of basis and purpose must be explicit enough to allow court "to see what major issues of policy were ventilated by the informal proceedings and why the agency reacted to them as it did").

[38] Portland Cement Ass'n v. Ruckelshaus, *supra* note 37, 486 F.2d at 393-94.

[39] *See* Wright, *supra* note 23, 26 ADMIN.L.REV. at 209-210.

disposal, are insubstantial.[40] The primary basis for these judgments is the data assembled by the staff in the draft Environmental Survey made public with the proposed rule. The conclusions reached by the staff in the Environmental Survey were in turn adopted without modification by the Commission as Table S-3 and embodied in the final rule. Thus, support for a rule limiting consideration of environmental issues to the numbers in Table S-3 must be found in one of three places: the Environmental Survey, the back-up documentation to which it refers, and the oral and written testimony offered at the hearing. It is to these sources we must look for a thorough ventilation of the underlying issues.

The Environmental Survey made public prior to the hearing was intended to "provide[] a basis for an informed consideration of the . . . environmental impact associated with the uranium fuel cycle . . . [and to] contain[] extensive references to background documents available to members of the public." 38 Fed.Reg. 49 (Jan. 3, 1973). Regarding most phases of the fuel cycle, these promises were fulfilled and the Environmental Survey did an adequate, even admirable job, of describing the processes involved. It assembles data on the consumption of resources, and discusses the risks of accidents and other hazards in detail, supporting the staff's conclusions with numerous references to the scholarly literature and to technical reports on file with the Commission. However, with regard to the two phases of the fuel cycle which are the focal points for this appeal, reprocessing and waste disposal,[41] that kind of detailed explanation

[40] *See supra* note 19.

[41] In a general way, "reprocessing" is that phase of the fuel cycle in which reusuable portions of spent fuel are extracted for recycling and the remaining radioactive residues are concentrated. "Waste disposal," a misnomer for what is more appropriately termed "waste storage and manage-

and support for the staff's conclusions was noticeably absent from the Environmental Survey as originally published.

The only discussion of high-level waste disposal techniques was supplied by a 20-page statement by Dr. Frank K. Pittman, Director of the AEC's Division of Waste Management and Transportation. This statement, delivered during the oral hearings, was then incorporated, often verbatim, into the revised version of the Environmental Survey published after the comment period.[42] Dr. Pittman began his statement by acknowledging that he was "broadly involved" with the subject of high-level waste management since he heads the division of the AEC charged with "responsibility for the development, construction and operation of facilities for ultimate management of commercial high-level waste." [43]

Dr. Pittman proceeded to describe for the first time in public the "design concepts" for a federal surface repository for retriveable storage of high-level waste.[44] This is essentially a warehouse in which sealed canisters containing cylinders of solidified nuclear wastes can be stored in water-filled basins recessed into the ground on a temporary basis (up to 100 years), until such time as a permanent waste disposal scheme is devised, when they can be removed.[45] While the "intended life" of the facility is only 100 years, some high-level wastes must be isolated for up to 250,000 years. *See supra* p. 7. Therefore, the Environmental Survey states, without further explanation, that in the future a "permanent" Federal repository for "geologic storage of high-level wastes" will be established and that the "Federal government will have the obligation to maintain control over the site *in perpetuity*." II-J.A. 724 [emphasis added].

Until recently the AEC planned to dispose of wastes by burying them deep inside abandoned salt mines. These plans were postponed indefinitely after a series of tech-

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ment," refers to containment of wastes during the long periods necessary for them to decay naturally into non-toxic substances. *See supra* note 3.

[42] *See* "Environmental Survey of the Uranium Fuel Cycle" (April, 1974) (hereafter "Revised Environmental Survey") G-23 n.18, II-J.A. 740.

For example, the discussion of the possibility of accidental release of wastes as a result of loss of coolant at *id.*, G-19-21, II-J.A. 736-737, is taken verbatim from Dr. Pittman's statement.

[43] II-J.A. 59. In Portland Cement Ass'n v. Ruckelshaus, *supra* note 37, 486 F.2d at 400 n.95, the court pointed out that where a "principal source of reliance by the agency" was "peculiarly subject to considerations of self-interest, more might be required than mere comments." Evaluation of a program by the in-house staff member charged with the responsibility for administering it falls within the intendment of that statement.

[44] The staff subsequently described the significance of Dr. Pittman's testimony as follows:

> When the [Environmental Survey] was published in November 1972, the data on the proposed Federal Repository for high level waste storage were limited to preliminary criteria and generalized statements. . . . The information in Dr. Pittman's statement is the first public release of the preliminary concepts for the Federal Repository and provides a summary of the current status and potential environmental effects of the high level waste interim storage facility and further AEC plans for longer term storage. The information from his testimony will be incorporated in the revised edition of the [Environmental Survey]. . . . The additional data presented by Dr. Pittman show that the interim high-level waste repository will be designed to have little environmental impact.

"Additional Information on Environmental Effects of the Uranium Fuel Cycle," II-J.A. 355-56.

[45] *See* Revised Environmental Survey, G-7, II-J.A. 724.

nical difficulties, including the discovery the salt mines might be susceptible to underground flooding. The Revised Environmental Survey devotes two sentences to recounting how prior waste disposal plans fared:

> It was planned to construct a Federal repository in a salt mine for long-term geological storage of solid high-level wastes by the mid 1970's. However, subsequent events have deferred the site selection and construction of such a facility.

II-J.A. 724. The "subsequent events" which led to the shelving of the salt mine plan are not discussed.[46]

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[46] The difficulties encountered regarding the primary site considered, salt beds near Lyons, Kansas, have recently been summarized as follows:

> Although that site had been under consideration for many years by the [AEC], it was not until 1971 that the commission and its contractors discovered two major problems with it. One was a series of abandoned gas and oil drill holes in the area. Another was an adjacent salt mine's extensive use of water to dissolve out the salt—including a hydraulic fracturing technique which had resulted in the disappearance underground of some 175,000 gallons of water. Both discoveries cast doubt on the long-term safety and integrity of the proposed Lyons site, since it appeared possible that water might penetrate the area and allow radioactive wastes to escape.

Boffey, "Radioactive Waste Site Search Gets Into Deep Water," 190 SCIENCE 361 (Oct. 24, 1975).

After the planned site near Lyons, Kansas was abandoned, attention focused on salt beds in southeastern New Mexico. Unexpected problems have recently been encountered at this site, too. A test hole hit a large underground pocket of brine and explosive gases. Not only would the presence of these gases threaten the safety of workers at any facility, but a "second disturbing aspect is that the presence of the brine solution may indicate that fluids have been migrating underground, thereby threatening the integrity of the site." *Id.* As the result, the search for a suitable site has been moved once again, this time to an area several miles away.

Dr. Pittman's description of the new plan—now also postponed indefinitely[47]—to build a surface storage facility can only fairly be described as vague, but glowing. He begins:

> . . . I hope I will be able to allay what I feel are unwarranted fears . . . and show that the bugaboo of waste management cannot logically be used as a rationale for delays in the progress of an essential technology for meeting our growing power demands.
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> [T]here are available today proven methods for managing the high-level waste from the nuclear industry in a way which will assure first that man will not be adversely affected by the radioactivity either by external or internal contact with the waste itself or by exposure to the penetrating radiation which it generates, and second that the environment [sic] effects will be very small.

II-J.A. 59-60. In less than two pages, he set out a very general description of what the facility is supposed to do, II-J.A. 63-66, accompanied by several schematic draw-

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[47] By letter dated April 9, 1975, the Administrator of ERDA informed the Congressional Joint Committee on Atomic Energy that preliminary funding for a Retrievable Surface Storage Facility was being deleted from the fiscal 1976 budget request pending a "comprehensive reevaluation of the federal program in this critical and controversial area." *See* "ERDA Shelves a Nuclear Waste Storage Plan," 188 SCIENCE 345 (April 25, 1975).

As part of that review, we understand revised impact statements are being prepared concerning reprocessing and waste disposal. As those matters are not before us, we intimate no opinion regarding the extent to which they may cure the deficiencies in the present proceeding.

Recent Congressional testimony by ERDA officials indicates a return to the plan to bury wastes, although no site has been finally chosen. "Salt, Rock Formations Favored for A-Wastes," *Washington Post*, May 11, 1976, A-2, cols. 1-3.

ings. These show the facility will have a cooling system, a transfer area and storage basins, but do not attempt to describe how they will be built and operated, what materials will be used, where such a facility might be located, or what it might cost to build and operate.

Dr. Pittman then explains that "the major factor in the design of the repository for high-level waste is the technique used to remove the heat from the waste." II-J.A. 63. Decaying radioactive waste spontaneously gives off substantial heat and "[s]hould adequate provisions not be made to remove this heat . . ., the waste and the canister would melt." *Id.* A "meltdown" would result in what Dr. Pittman calls a "situation of considerable concern," which would involve the "loss of some fraction of the isolation of the radioactive material from the environment." II-J.A. 65. No attempt is made to describe how serious a radioactivity hazard would be presented.

In a paragraph which is carried over verbatim in the Revised Environmental Survey, II-J.A. 726, Pittman states:

> The Commission has carried out extensive evaluations of safety, reliability, operability, maintainability and economics of various methods for removing heat, and has essentially narrowed the area for further study to techniques using either water or air as the heat transfer medium.

II-J.A. 64. No citations are given for these studies; in fact, there are no references to back-up materials supporting any of Pittman's statement, or those portions of the Revised Environmental Survey drawn from it.[48]

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[48] Following Dr. Pittman's presentation one of the presiding board members remarked:

> . . . one of the, I think, outstanding practices of the Staff has been in the past, at least as far as I can tell,

Again without benefit of details, Dr. Pittman offers conclusory reassurances that the proposed facility will be designed so that the possibility of a "meltdown" can be dismissed as "incredible":

> The probability of this situation occurring is prevented by a combination of engineered features including, (i) redundancy of power supply and other essential cooling systems; (ii) structural strength to withstand credible forces of nature—earthquake, tornado, etc.; (iii) combination of structural strength, plant security, etc., to withstand credible overt forces of man; (iv) modular basin cell construction which limits the number of canisters subject to a single catastrophic event.

> to meticulously document the assumptions that are made in the discussions. I find that that has not been done here. . . . I guess I must assume that one of the reasons that those assumptions have not been documented and clarified or justified in the purest sense of the word, is because of the time schedule required to get this thing on so we could get to hearings. Can it be assumed that if there is going to be a significant revision to this document that in those areas where assumptions are made, particularly where there is a statement to the effect that something is trivial, or insignificant, that somewhere there will appear in that same document some kind of justification based on data or a reference which one can go back to and find the source.

II-J.A. 116-17.

A staff member assured the questioner "[w]e will make every effort to go back and see if we can improve that," II-J.A. 118, and subsequently the staff submitted a 56 page document of "Additional Information on Environmental Effects of the Uranium Fuel Cycle," II-J.A. 352. However, less than two pages are devoted to the waste disposal issues addressed by Dr. Pittman, and these merely correct four minor numerical and typographical errors or omissions in his testimony. *See* II-J.A. 402-03. Nor does the Revised Environmental Survey fill in the gaps in Dr. Pittman's testimony.

> Thus, before a meltdown could occur, it would be necessary to have a series of failures of systems which will be engineered, constructed, and operated for maximum reliability under rigorous quality assurance programs before a situation could occur where sufficient water could not be added to and maintained in the cell to keep it from leaking or boiling dry. The timing for such a series of failures to result in uncorrectable situations is important. The individual failure of power systems for circulating the coolant would not result in pool water boiling for at least 16 hours. Various corrective actions may be taken any time within a week which would prevent cell water from boiling away. After the complete loss of water, an additional day would be required before the waste would begin to melt. The number of sequential failures required of highly reliable systems, combined with the long time periods available for repair and recovery from each, result in the judgment that this is an incredible incident.

II-J.A. 65-66. His unadorned conclusion is in turn incorporated verbatim into the Revised Environmental Survey.[49]

Other than the broad reference to "structural strength, plant security, etc., to withstand credible overt forces of man", there is no discussion of how the facility would be protected from terrorism.[50] While Dr. Pittman says

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[49] *See* "Environmental Survey of the Uranium Fuel Cycle" (April, 1974) G-19-20, II-J.A. 736-737.

[50] When Dr. Henry Kendall, an expert witness for Consolidated National Intervenors, tried to raise the risks of terrorism, he met the following reception from the chairman of the hearing board:

> I have just one question . . . with regard to nuclear blackmail and the potential terrorist activities. What I am a little puzzled about is its relevance . . . . I say this with all due respect, Dr. Kendall; I guess those words are

"[v]arious corrective actions" might be taken to prevent a meltdown, none are specified.

Dr. Pittman concludes with the judgments that:

> . . . (1) the program being followed by the industry under AEC regulation and by the AEC offers assurance that the commercial high-level waste will be managed safely from its initial production; (2) the surface storage method, to be used by the AEC, is good for as long as adequate human surveillance and maintenance effort is continued; (3) the probability that work currently under way will demonstrate the use of bedded salt as a safe, acceptable, ultimate disposal method within the next ten to fifteen years is very high; (4) should bedded salt not prove to be acceptable, other acceptable geologic

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exciting reading in the newspapers, but I would like to have [you] indicate the relevance between the responsibilities of the Atomic Energy Commission under the National Environmental Protection Act [sic] in these respects as against, at least, what I read to be the subject matter of your comments in this particular wise, and that is the military and potential security aspects of the transportation of nuclear materials. Do I make myself clear?

An attorney for the intervenors then explained that NEPA requires consideration of more than the "simplistic questions" of "how many fish will get hurt. . . ." The chairman responded:

> You see then, forgive me for using the word, a fusion somehow between what is known as, I understand, the impact on the environment as against the political and military security?

[Attorney]:

> Of course, what is precisely involved in political and military security is that someone threatens to do a heck of a lot of damage to the environment in exchange for something they want.

II-J.A. 213-16.

disposal concepts offer reasonable probability of reaching a point of acceptability within two or three decades; and (5) the waste in initial storage will be easily retrievable for either near- or far-term disposal methods when they are developed.

II-J.A. 82. There is no discussion of how "adequate human surveillance and maintenance" can be assured for the periods involved, nor what the long-term costs of such a commitment are, nor of the dangers if surveillance is not maintained.[51] Nor is any explanation offered for Dr. Pittman's optimism regarding bedded salt as a disposal method, since the problems which have surfaced and delayed that program are not mentioned.[52] Nor does the statement anywhere describe what "other

[51] A subsequent report to the Administrator of ERDA by a four-man task force, including Dr. Pittman, reflects a much less rosy assessment of the problems of reprocessing and waste disposal. NUCLEAR FUEL CYCLE: A REPORT OF THE FUEL CYCLE TASK FORCE, ERDA-33 (March, 1975).

The unanimous task force concluded, *inter alia*, "there are still many technical problems and uncertainties in the overall area of processing of spent fuel and properly managing its radioactive waste", *id.*, 40; "[t]he costs of storage and ultimate disposal . . . are very much higher than had previously been assumed . . . .", *id.*, 46; "[the public] fear[s] that the radioactive waste generated . . . will either be neglected, and thus place an unacceptable hazard potential on mankind, or be managed in a way that will place an unacceptable burden on future generations to assure continued public safety. [T]hese . . . fears . . . are supported by a fair segment of the scientific community—many of whom otherwise support the use of nuclear reactors for generation of electric power", *id.*, 49-50.

[52] *See supra* note 46. Contrary to Dr. Pittman's unexplained optimism, an article in SCIENCE recently termed finding a site for long-term disposal of radioactive wastes "one of the key unresolved problems of the nuclear era." Boffey, *supra* note 46, 190 SCIENCE 361 (Oct. 24, 1975).

acceptable geogologic disposal concepts" are under consideration.

When Dr. Pittman finished, no questions were put to him by the hearing board.[53] No cross-examination was permitted.

Based on Dr. Pittman's statement, the Revised Environmental Survey concludes that the resources consumed in waste storage will be minimal, that "under normal conditions" no radioactivity will be released, and that the possibility of a serious accident is "incredible."[54] In short, based on the information in Dr. Pittman's statement, the Commission concluded that the future environmental effects from the disposal of high-level nuclear wastes are negligible. This conclusion is in turn embodied in Table S-3, and further consideration of the issue terminated.

We do not dispute these conclusions. We may not uphold them, however, lacking a thorough explanation and a meaningful opportunity to challenge the judgments underlying them. Our duty is to insure that the reasoning on which such judgments depend, and the data supporting them, are spread out in detail on the public record. Society must depend largely on oversight by the technically-trained members of the agency and the scientific community at large to monitor technical decisions. The problem with the conclusory quality of Dr. Pitt-

[53] One short comment was made concerning commercial disposal of low-level waste, II-J.A. 115, as was the observation, quoted *supra* note 48, regarding failure to provide back-up documentation.

The board's quiescence regarding Dr. Pittman is in marked contrast to its often hostile questioning of expert witnesses for the intervenors. *See, e.g., supra* note 50.

[54] Revised Environmental Survey, *supra* note 42, G-2-G-3, II-J.A. 719-720.

man's statement—and the complete absence of any probing of its underlying basis—is that it frustrates oversight by anyone: Commission, intervenors, court, legislature or public. Given the opportunity, Dr. Pittman might have provided convincing answers to many of the questions which his statement leaves untouched. Since that did not occur, however, his judgments must either be accepted at face value, or rejected out of hand.

Although the vagueness of the presentation regarding waste disposal made detailed criticism of its specifics impossible, *see* II-J.A. 257, the public interest intervenors did offer a number of more general comments concerning the Commission's approach. They criticized the Commission for a general "failure to distinguish between design objectives on the one hand and performance on the other," II-J.A. 124, noting that no consideration had been given actual experience with storage of wastes generated by weapons production. II-J.A. 272-74. They also questioned confident assertions by the AEC that long-term waste management is feasible, laying particular stress on the immense time periods involved which mock human institutions:

> Except for the storage of liquid wastes in tanks, for which experience from weapons production applies, all proposals for long term storage or disposal of high level waste from the nuclear power industry lie at the research and development stage.
>
> * * * *
>
> The impression is inescapable, in view of the present imprecise state of affairs, that no convincing statements exist regarding the long term environmental impact attending the storage and/or disposal of wastes from fuel reprocessing.
>
> * * * *
>
> The times during which radioactive wastes must remain secure from the biosphere have no parallel

> in human affairs. Eight hundred years are required for fission products alone and millions of years if the fission products continue to be contaminated with transuranic elements at present levels. Fission technology requires that man issue guarantees on events far into the future, and it is not clear in most cases how this can be done. Institutional arrangements do not exist and never have existed to guarantee the monitoring of or attendance upon storage facilities over a millennium. In the range of a million years, serious geological uncertainties arise and even the survival of man may be doubtful. "In perpetuity" has little real meaning in human affairs.

II-J.A. 261-2. They reiterated repeatedly that the problems involved are not merely technical, but involve basic philosophical issues concerning man's ability to make commitments which will require stable social structures for unprecedented periods.[55]

The intervenors pointed out that storing wastes aboveground places a premium on stable human institutions for monitoring and surveillance, II-J.A. 275-76; that until plans for long-term disposal in the salt beds at Lyons, Kansas fell through, *see supra* note 46, the agency had itself rejected the idea of surface storage because of the surveillance problems. II-J.A. 210-11, 287-89.

After reviewing the record, the presiding hearing board isolated several areas of controversy which it felt ought to be addressed by the Commission in issuing the proposed rule. Included were the adequacy of the discus-

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[55] II-J.A. 275-76. An illuminating perspective is provided in D. Farney, *Ominous Problem: What to Do with Radioactive Waste*, 5 SMITHSONIAN MAG. 20, —— (1974):

> The entire recorded history of mankind is but a fraction of the 250,000-year storage time of plutonium. Neanderthal man appeared only about 75,000 years ago.

sion of waste disposal systems,[56] and the need for fuller background documentation. II-J.A. 498.

The Commission disposed of these issues summarily in its statement of basis and purpose accompanying the promulgation of the rule without attempting to articulate responses to any of the points which had been raised regarding waste disposal:

> Considerable information was presented at the hearing on high level waste storage utilizing a retrievable surface storage facility. A description was given of such facility, the normal radiological effluents, and a maximum credible accident.
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> • • • •
>
> While such a waste storage facility has not been constructed, preliminary conceptual designs have been developed using existing technology based on well established data and techniques.

[56] The presiding board wrote:

> At the time the Environmental Survey was issued for public comment in the Rulemaking Proceeding, together with the proposed amendments to the Rules, the Survey did not contain data with regard to proposed waste disposal systems. During the course of the oral presentation, the Regulatory Staff offered for the record an extensive presentation by Dr. Frank Pittman regarding various methods for waste disposal which were in the planning stage, and, based upon such planning, assigned various values regarding assumed environmental impact of such waste storage facilities. It was argued that, in all other respects, the Survey dealt with the environmental impact of actual and existing facilities; but that, with respect to waste disposal, the Survey was unreliable in that it dealt with non-existent facilities; . . . .

II-J.A. 490.

While this is not an entirely accurate synopsis of the intervenor's position as set out above, it focused the Commission's attention on this aspect of the proceedings.

> The Commission believes that the Survey and hearing record provide an adequate data base for the regulation adopted.

39 Fed.Reg. 14189 (April 22, 1974); II-J.A. 507.1 [unnumbered page following 507].[57] Thus, to the limited extent that any give-and-take was fostered on the nuclear waste issues, the Commission, in its final decision, failed to address major contentions that were raised.

(C.)

In substantial part, the materials uncritically relied on by the Commission in promulgating this rule consist of extremely vague assurances by agency personnel that problems as yet unsolved will be solved. That is an insufficient record to sustain a rule limiting consideration of the environmental effects of nuclear waste disposal to the numerical values in Table S-3. To the extent that uncertainties necessarily underlie predictions of this importance on the frontiers of science and technology, there is a concomitant necessity to confront and explore fully the depth and consequences of

[57] We note that the Commission also promised to undertake "a more definitive assessment" of the environmental effects of waste storage as more information becomes available through subsequent environmental impact statements. 39 Fed. Reg. 14190 (April 22, 1974); II-J.A. 508.

While that is praiseworthy as an acknowledgment of the Commission's responsibility to reassess its actions in the light of later information, it cannot be used as a bootstrap to excuse the present rule cutting off further consideration in licensing proceedings.

We have already held in *Vermont Yankee, supra* p. 8, that the Commission may not refuse to consider the environmental effects of waste disposal when it licenses an individual reactor simply by promising to consider them later when it licenses facilities for waste disposal. We see no reason why that principle applies with any less force to accomplishing the same result through rulemaking.

such uncertainties. Not only were the generalities relied on in this case not subject to rigorous probing—in any form—but when apparently substantial criticisms were brought to the Commission's attention, it simply ignored them, or brushed them aside without answer. Without a thorough exploration of the problems involved in waste disposal, including past mistakes, and a forthright assessment of the uncertainties and differences in expert opinion, this type of agency action cannot pass muster as reasoned decisionmaking.[58].

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[58] We reject the contention that Table S-3 is itself a "major Federal action" requiring an environmental impact statement. The Commission characterized this rulemaking as merely addressing "a procedural question involving the implementation of NEPA . . . ." 39 Fed.Reg. 14188. *Cf.* Gage v. AEC, 479 F.2d 1214, 1222 n.26 (D.C.Cir. 1973). Petitioners, however, claim Table S-3 has "substantive" effect, since it establishes values for environmental effects on which subsequent licensing decisions may turn. Reply brief at 12. While we agree that Table S-3 may have important decisional consequences by implying that fuel cycle problems are manageable, in the circumstances presented here, we do not believe these implications ripen into a proposal for agency action until they are incorporated into individual licensing decisions. *Compare* Aberdeen & Rockfish R.C. v. SCRAP, 422 U.S. 289, 320 (1975) *with* SIPI, *supra* note 11, *and* Sierra Club v. Morton, 514 F.2d 856 (D.C.Cir. 1975), *rev'd sub nom.* Kleppe v. Sierra Club, 44 U.S.L.W. 5104 (U.S., June 28, 1976). At that point an impact statement will be prepared with regard to the licensing decision. We do not read the statute as requiring more.

Petitioners also argue that Table S-3 violates NEPA because it is incomprehensible to "non-technical minds." Environmental Defense Fund v. Corp of Engineers, 348 F.Supp. 916, 933 (W.D. Miss.), *aff'd.*, 492 F.2d 1123 (5th Cir. 1972). We do not reach that issue. The defects, if any, may be cured by fuller explanation in a revised statement of basis and purpose, or in subsequent NEPA statements incorporating Table S-3.

[Continued]

Many procedural devices for creating a genuine dialogue on these issues were available to the agency—including informal conferences between intervenors and staff, document discovery, interrogatories, technical advisory committees comprised of outside experts with differing perspectives, limited cross-examination, funding independent research by intervenors, detailed annotation of technical reports, surveys of existing literature, memoranda explaining methodology. We do not presume to intrude on the agency's province by dictating to it which, if any, of these devices it must adopt to flesh out the record. It may be that no combination of the procedures mentioned above will prove adequate, and the agency will be required to develop new procedures to accomplish the innovative task of implementing NEPA through rulemaking. On the other hand, the procedures the agency adopted in this case, if administered in a more sensitive, deliberate manner, might suffice.[59] Whatever techniques

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[58] [Continued]

Finally, we reject the related argument that plenary consideration of alternatives was necessary in this proceeding. We agree with the Commission that this may be deferred until action is proposed to license particular disposal facilities. For purposes of this proceeding, provided a sufficiently conservative and credible assessment of a particular waste disposal method is used, it is not material that another method might turn out to be even more desirable. *See supra* note 13. Of course, we do not exclude the possibility that limited consideration of certain alternatives (*e.g.*, the consequences of not proceeding at all) may be necessary to meaningful judgments in a proceeding such as the present.

[59] Agencies are always free to adopt "hybrid procedures" beyond the minima prescribed by 5 U.S.C. § 553, and commonly do. United States v. Florida East Coast Ry., 410 U.S. 224, 236 n.10 (1973). In this case, the Commission elected to provide certain hybrid procedures in addition to those required by § 553—oral hearings and questioning by a presiding board. By listing other techniques, *supra* p. 39, which might aid the Commission in compiling an adequate record, we do not intimate that it must adopt any of them. What is of

the Commission adopts, before it promulgates a rule limiting further consideration of waste disposal and reprocessing issues, it must in one way or another generate a record in which the factual issues are fully developed.

Our colleague, concurring specially, expresses the view that there is "little to be gained other than delay" by remanding for additional proceedings, since it is "almost inevitable" that the Commission will reach the same result "after fully considering the problems and alternative methods of waste disposal." [60] Even if true, that would only supply an additional reason to require the Commission to acknowledge the risks and problems, as well as lay bare its own reasoning. Agencies are less likely

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concern to us is that the record after remand disclose a thorough ventilation of the issues.

On paper, the procedures used to supplement § 553 here were virtually identical to those approved by the court in International Harvester v. Ruckelshaus, *supra* note 23, 478 F.2d at 631, in which oral statements were allowed and the hearing board was authorized to ask questions submitted by the parties. However, in practice the procedures were administered quite differently in *International Harvester:* "[T]he hearing officers did not propound the pre-submitted questions like robots; they were charged with conducting a hearing for the purpose of focusing information needed for decision and they quite appropriately 'followed up' on questions." *Id.* In this case the board members asked no questions whatsoever of Dr. Pittman. *See supra* note 53.

[60] Concur at 5. According to Judge Tamm, on remand "the Commission may or may not adopt one of the majority's [procedural] suggestions, but will in any case seek to comply by mechanically generating more 'negative' information respecting current problems with disposal of high level radioactive wastes and then will 'overcome' this information with citations to favorable studies and articles." *Id.*, 4.

Stripped of rhetoric, this means that the Commission may reach the same result on an adequate record—which, of course, is why we remand rather than reverse.

to persist in the face of information publicly exposing the fallacies, if any, in their position. In any event, NEPA does not guarantee a particular outcome on the merits; rather, the statute mandates only a "careful and informed decisionmaking process" to enlighten the decisionmaker and the public.[61] In the rulemaking context, that requires the Commission to identify and address information contrary to its own position, to articulate its reasoning and to specify the evidene on which it relies.[62] The Commission may well reach the same conclusion on remand. But if it does so on such a record, the Congress, the courts, and the public will all know where we stand.

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[61] *See* Calvert Cliffs' Coordinating Comm. v. AEC, *supra* note 14, 449 F.2d at 1115. *See also,* Comm. for Nuclear Responsibility, Inc. v. Seaborg, *supra,* 463 F.2d at 787; NRDC v. Morton, *supra* note 15, 458 F.2d at 833.

[62] Evidently Judge Tamm would permit Dr. Pittman to supplement his testimony without giving those who disagree an opportunity to criticize or comment on the new material (*e.g.*, "without reopening the oral proceeding," Concur at 3). We would not agree.

Unlike explanation of the *Commission's* rationale, Dr. Pittman's testimony is part of the evidentiary support underlying the proposed rule. *Cf.* Concur at 7. Both rudimentary procedural fairness and § 553 require that the evidentiary "basis" for a proposed rule be subject to public scrutiny and comment. *See* Portland Cement Ass'n v. Ruckelshaus, *supra* note 37, 486 F.2d at 393 n.67; Mobil Oil Corp. v. FPC, *supra* note 23, 483 F.2d at 1251 n.39. This variant of the traditional adversary process permits other experts, and the public, to bring to bear the purifying effect of their comments.

At least where the existing record is inadequate to sustain a rule, an agency cannot buttress its case with additional data not subject to public comment. "If a particular rule rests on an extensive analysis of data or a complex prediction . . . the agency should not rely on any research methods or data which were not presented to the interested parties for comment or criticism." Wright, *supra* note 23, 59 CORNELL L.REV. at 383, n.34 (1974).

It has become a commonplace among proponents of nuclear power to lament public ignorance.[63] The public—the "guinea pigs" who will bear the consequences of either resolution of the nuclear controversy—is apprehensive. But public concern will not be quieted by proceedings like the present.

> I know no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion.[64]

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[63] *See, e.g.*, Remarks by USNRC Commissioner Edward A. Mason at MIT (March 4, 1976) *quoted* SCIENCE & GOV. RPT., 4 (April 1, 1976):

> So the biggest problem impeding the contribution of nuclear power in meeting the nation's energy needs seems to me to be the lack of informed public understanding. . . .
>
> * * * *

Edward Teller, "Nuclear Salvation," NEWSWEEK (May 17, 1976) at 15:

> Indeed, there is no better subject with which to scare people than nuclear energy. What is new, what is not completely understood, is always frightening. But nuclear energy is a special case. It comes from a remote part of research that, in the minds of many people, borders on science fiction. It was developed in wartime and shrouded in secrecy. It came to the attention of mankind when, in two strokes, more than 100,000 people were killed in the final days of a terrible war. . . . Can we, in our democratic society, overcome unreasonable fears?

[64] Thomas Jefferson, Letter to William Charles Jarvis (Sept. 28, 1820).

The Commission's action in cutting off consideration of waste disposal and reprocessing issues in licensing proceedings based on the cursory development of the facts which occurred in this proceeding was capricious and arbitrary.. The portions of the rule pertaining to these matters are set aside and remanded.[65]

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[65] We are aware of suggestions that where agency action is based on an inadequate record, the appropriate remedy may be to remand for supplementation rather than a declaration that the rule or order is invalid. *See* Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U.PA.L.REV. 509, 539 (1974). *But cf.* Camp v. Pitts, 411 U.S. 138, 143 (1973): If the decision of the agency "is not sustainable on the administrative record made, then the . . . decision *must be vacated* and the matter remanded . . . for further consideration." *quoted* F.P.C. v. Transcontinental Gas Pipe Line Corp., *supra* note 26, 96 S.Ct. at 582 [emphasis added].

Separate Statement of Chief Judge BAZELON:

I add a word of my own on some of the broader implications of Judge Tamm's concurrence.

I agree that courts should be reluctant to impose particular procedures on an agency. For example, requiring cross-examination in a rulemaking proceeding is radical therapy, which may cause the patient to suffer a slow, painful death. "There is a not insignificant potential for havoc . . . [which is] likely to be disproportionate to the values achieved. . . ." *International Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 631 (D.C.Cir. 1973). But I reject the implication that any techniques beyond rudimentary notice and comment are needless "over-formalization" of informal rulemaking. Concur at 5. Unhappily, no such bright line can be drawn between rulemaking and adjudicatory proceedings.[1]

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[1] The concurrence relies on Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L.REV. 375 (1974), which explicitly assumes an idealized model differentiating sharply between "policy-type rules or standards, on the one hand, and proceedings designed to adjudicate particular cases on the other." *Id.*, 386. This model posits that accurately determining facts is relatively unimportant in rulemaking because the "ultimate shape of the rule seldom 'follows from the facts.'" *Id.*, 379 n.15. Based on this conceptual distinction, drawn from Bi-Metallic Investment Co. v. State Bd. of Equalization, 239 U.S. 441 (1915), it is argued "An adjudication is fair to the individual only if the facts are accurately found. . . . [I]n the rulemaking context, fairness is not identified with accuracy, and procedures designed to maximize accuracy at the cost of all other values are simply inappropriate." *Id.*, 379.

With all due respect, this assumes away the hybrid rulemaking problem which arises primarily when rulemaking procedures are used in contexts where accurate fact-finding *is* of high relative importance. *See infra* p.2 and n.3.

The purpose of rulemaking was to allow public input on policy, whereas adjudication was designed to resolve disputed facts. *See supra* note 1. However, in response to the "paralysis" of the administrative process in the last decade, rulemaking has been expanded into fact-intensive areas previously thought to require adjudicatory procedures.[2] Administrative proceedings are now common which do not fit neatly into either the rulemaking or adjudicatory category. These new proceedings are "hybrids" in the sense that they involve issues of general applicability which can be treated efficiently only in generic proceedings, but nonetheless involve factual components of such relative importance that a greater assurance of accuracy is required than that which accompanies notice and comment procedures.[3]

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[2] *See, e.g.*, United States v. Allegheny-Ludlum Steel Corp., 406 U.S. 742 (1972); United States v. Florida East Coast Ry., 410 U.S. 224 (1973) (ratemaking).

[3] The development of scientific or technical standards is a prime example. These decisions may involve both assessing scientific evidence, and also a "legislative" or policy component as to what level of risk is "safe," and how uncertainties are to be valued. *See* Handler, *A Rebuttal: The Need for a Sufficient Scientific Base for Governmental Regulation*, 43 GEO.WASH.L.REV. 808, 809 (1975).

The relative centrality of the fact-finding and policy-making components may vary depending on the precise regulatory scheme and the state of knowledge. *Compare* Ethyl Corp. v. EPA, No. 73-2205 (D.C.Cir., March 19, 1976) (en banc) (legislative policy decision) *with* Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 390-402 (D.C.Cir. 1973), *cert. denied*, 417 U.S. 921 (1974).

The present proceeding was devoted almost entirely to technical fact-finding. The Commission characterized its purpose as data-gathering, rather than an analysis of alternatives or costs and benefits, 39 Fed.Reg. 14188, and specifically disclaimed that the values arrived at represented "safe" operating limits. *Id.*, 14190. This was simply not, as Judge Tamm states, a proceeding to arrive at an "administrative

The need for reliable fact-finding does not necessarily imply transplanting trial-type procedures. Factual issues in hybrid proceedings tend to be complex scientific or technical ones involving mathematical or experimental data, or other "legislative facts" [4] peculiarly inappropriate for trial-type procedures. Agencies should innovate procedural formats responsive to the new problems created by hybrid rulemaking. Some agencies (such as FDA and EPA) have already begun to do so.[5]

Decisions in areas touching the environment or medicine affect the lives and health of all. These interests, like the First Amendment, have "always had a special claim

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weighing of risks and benefits of additional reactors," Concur at 7, or to decide "whether licensing an additional reactor is worth the additional environmental risk . . . ." Concur at 5.

[4] *See* 2 Davis, Administrative Law Treatise § 15.03 (1958):

> When a court or an agency finds facts concerning the immediate parties—who did what, where, when, how, and with what motive or intent—the court or agency is performing an adjudicative function, and the facts are conveniently called adjudicative facts. . . .
>
> Stated in other terms, the adjudicative facts are those to which the law is applied in the process of adjudication. They are the facts that normally go to the jury in a jury case. They relate to the parties, their activities, their properties, their businesses. Legislative facts are the facts which help the tribunal determine the content of law and of policy and help the tribunal to exercise its judgment or discretion in determining what course of action to take. Legislative facts are ordinarily general and do not concern the immediate parties.

[5] Judge Tamm raises the specter that the "entirely predictable" response by administrators to "procedural refinements" will be so many adjudicatory procedures that "the advantages of informal rulemaking as an administrative tool are lost in a heap of judicially imposed procedure." Concur

to judicial protection." [6] Consequently, more precision may be required than the less rigorous development of scientific facts which may attend notice and comment procedures.

Despite the controversy surrounding the proper standard of review in informal rulemaking cases, *see* Concur at n.2, there is less disagreement on this essential point than meets the eye. With customary perspicacity, Judge Friendly has observed that often it does not really matter much whether a court says the record is remanded because the procedures used did not develop sufficient evidence, or because the procedures were inadequate.[7] *From*

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at 6. Adjudicatory forms are no talisman which would guarantee an agency an adequate record.

Moreover, Williams, *"Hybrid Rulemaking" Under the Administrative Procedure Act: A Legal and Empirical Analysis*, 42 U.CHI.L.REV. 401 (1975), points out that the hybrid rulemaking cases have not in fact had that kind of impact on agency behavior. *Id.*, 425, 428, 448. Contrary to Judge Tamm's statement that cross-examination afforded only delay and something to be traded off for "substantative concessions," Concur at n.6, Williams actually discovered that the parties were able to agree on *procedural* innovations which better met their needs and were less time-consuming than cross-examination. *See* Majority Op., *supra* note 28.

[6] Environmental Defense Fund, Inc. v. Ruckelshaus, 439 F.2d 584, 598 (D.C.Cir. 1971) (Bazelon, C.J.). *See also* Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U.PA.L.REV. 509, 512-13 (1974).

[7] In discussing the article by Judge Wright, *supra* note 2, on which the concurrence relies, Judge Friendly writes:

> A judge not in the arena must wonder whether the war Judge Wright is waging with his colleagues is not in some degree semantic. . . . One can hardly quarrel with the conclusion that if a reviewing court finds that the procedures followed by the agency in adopting a rule have not produced a body of evidence enabling it to pronounce the required benediction, the court must remand. . . . It is thus not too consequential whether a court invalidates a rule on the ground that the procedures have

the standpoint of the administrator, the point is the same: the procedures prescribed by § 553 will not automatically produce an adequate record. Thus, although Judge Tamm vehemently opposes the concept of procedural review of informal rulemaking, he agrees to send this case back for a fuller development of the facts *even though the dictates of § 553 were followed.*[8]

Of course, important differences remain *from the standpoint of a reviewing court.* I am convinced that in highly technical areas, where judges are institutionally incompetent to weigh evidence for themselves, a focus on agency procedures will prove less intrusive, and more likely to improve the quality of decisionmaking, than judges "steeping" themselves "in technical matters to determine whether the agency has exercised a reasoned discretion." *See Ethyl Corp.* v. *EPA*, No. 73-2205 (D.C.Cir., March 19, 1976)

> not developed substantial evidence to support it or even evidence adequate to rebut a claim that it is arbitrary and capricious, or, instead, takes the route of prescribing ad hoc procedural requirements in addition to those of section 553. . . . Both roads lead to the conclusion that an administrator engaged in rulemaking governed by the APA cannot always be sure that rudimentary notice and comment procedures, even if they measure up to Judge Wright's salutary specifications, will always suffice.

Friendly, *Some Kind of Hearing*, 123 U.PA.L.REV. 1267, 1313-14 (1975) [footnotes omitted].

[8] The logic of Judge Tamm's position that the "deficiency" here is not with the procedures used to make a record, just with the "record generated," Concur at 2, totally escapes me.

Judge Tamm also criticizes the court for failing to tell the Commission "in precise terms" how to achieve a "thorough ventilation" of the factual issues. Concur at 3. He apparently finds greater specificity in an instruction to the Commission to provide "an explanation of the basis" of its conclusions. Concur at 7.

(en banc) (Bazelon, C.J., concurring), *cert. denied*, 44 U.S.L.W. 3719 (June 10, 1976).[9]

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[9] *Cf.* Lathan v. Brinegar, 506 F.2d 677, 693 (9th Cir. 1974) (en banc):

> We think that the courts will better perform their necessarily limited role in enforcing NEPA if they apply [the "without observance of procedure required by law" standard of 5 U.S.C.] § 706(2)(D) in reviewing environmental impact statements for compliance with NEPA than if thy [sic] confine themselves within the straight jacket of [the "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law" standard of 5 U.S.C.] § 706(2)(A).

See also Ohio v. Wyandotte Chem. Corp., 401 U.S. 493, 504 (1971) (original jurisdiction declined in pollution case involving complex, novel and technical factual questions):

> . . . Ohio is raising factual questions that are essentially ones of first impression to the scientists. The notion that appellate judges, even with the assistance of a most competent Special Master, might appropriately undertake at this time to unravel these complexities is, to say the least, unrealistic. Nor would it suffice to impose on Ohio an unusually high standard of proof. That . . . would not lessen the complexity of the task of preparing responsibly to exercise our judgment, or the serious drain on the resources of this Court it would entail.

TAMM, *Circuit Judge, separate statement concurring in result*:

Licensing a nuclear reactor unquestionably constitutes a "major Federal action[] significantly affecting the quality of the human environment" requiring a "detailed" environmental impact statement under section 102 (2) (C) of NEPA, 42 U.S.C. § 4332(2) (C) (1970). Approval of such a facility, which inevitably will produce high level radioactive wastes, some of which must be isolated from the "biosphere" for a quarter of a million years, undeniably necessitates an "irreversible and irretrievable commitment[] of resources" within the meaning of the Act. 42 U.S.C. § 4332(2) (C) (v). A panel of this court has previously indicated that NEPA requires potential environmental problems of this magnitude to be dealt with in advance of such a substantial commitment, not ignored until new commitments inevitably follow from the old. *See, e.g., Calvert Cliffs' Coordinating Comm. v. AEC*, 449 F.2d 1109, 1128 (D.C. Cir. 1971).[1] I agree with the majority that NEPA requires the Commission fully to assure itself that safe and adequate storage methods are technologically and economically feasible. It forbids reckless decisions to mortgage the future for the present, glibly assuring critics that technological advancement can be counted upon to save us from the consequences of our decisions. I further agree with the conclusion of the majority that it is impossible to determine from the record before us whether the Commission has fulfilled its statutory obli-

[1] A major purpose of NEPA was to avoid the limiting effect of incremental decisionmaking by confronting environmental problems before foreclosing alternative methods of dealing with them. *See* S. Rep. No. 296, 91st Cong., 1st Sess. 5 (1969), *quoted in* Majority 9. To this end, NEPA requires a thorough cost-benefit study in each case before undertaking major federal action affecting the quality of the human environment. Calvert Cliffs' Coordinating Comm. v. AEC, *supra* at 1128.

gation under NEPA in adopting the S-3 table, in effect deciding that the incremental environmental effect of storing the waste of an additional nuclear reactor is negligible, or whether it has uncritically adopted as its own the undocumented conclusions of a single witness that the waste storage issue is a "non-problem" with which the Commission need hardly concern itself at this time. Accordingly, the inadequacy of the record demands that we remand this case to the Commission in order to ensure that it has taken a hard look at the waste storage issue. I cannot, however, without qualification, endorse the approach the majority has taken to reach this result or its suggested disposition on remand.

The majority appears to require the Commission to institute further procedures of a more adversarial nature than those customarily required for informal rulemaking by the Administrative Procedure Act, 5 U.S.C. § 553 (1970).[2] The Commission chose to proceed by "hybrid" rulemaking below, allowing petitioners to present oral arguments before the Commission and subjecting participants to questions, but not permitting participants to cross-examine. Majority note 59. By so proceeding the Commission exceeded the minimum procedural requirements of section 553.[3] In my view, the deficiency

[2] The standard of review under section 553 has been the subject of considerable discussion in recent years, especially within this judicial circuit. *See, e.g.*, the cases and articles cited in Majority note 23.

[3] Section 553 imposes only three obligations on the rulemaker. First the rulemaker must give adequate and effective notice of "either the terms or substance of the proposed rule or a description of the subjects and issues involved." Secondly, he must "give interested persons an opportunity to participate . . . through submission of written data, views, or arguments with or without opportunity for oral presentation." Finally, the rulemaker must "incorporate in the rules adopted

is not with the *type* of proceeding below, but with the completeness of the record generated.[4] More procedure will not, in this case, guarantee a better record, and a better record can be generated without reopening the oral proceeding at this time. We cannot conclude confidently from this record whether the Commission's staff considered all relevant factors, including the facts petitioners call to our attention, in reaching the figures embodied in Table S-3; nor can we conclude from Dr. Pittman's oral statements, substantially devoid of documentation, whether these figures represented conclusions drawn from more exhaustive research into the waste storage problem conducted by the head of the Commission division charged with this task. If Dr. Pittman's conclusions were so based, I believe the Commission is entitled to accept them, provided, of course, it is assured that they are reasonably objective.[5]

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a concise and general statement of their basis and purpose." 5 U.S.C. § 553 (1970). *See generally* Verkuil, *Judicial Review of Informal Rulemaking*, 60 VA. L. REV. 185 (1974).

The "concise and general statement" required by section 553 must be sufficiently complete and detailed to enable the court to accomplish its reviewing function, assuring itself that the agency has engaged in reasoned decisionmaking, has given serious thought to alternative rulings, and has provided reasoned explanations for controversial normative and empirical determinations. In short, "the reviewing court must satisfy itself that the requisite dialogue occurred and that it was not a sham." Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L. REV. 375, 381 (1974).

[4] The majority also recognizes that the procedures utilized by the Commission might suffice "if administered in a more sensitive, deliberate manner." Majority 40.

[5] *See* Environmental Defense Fund, Inc. v. Corps of Engineers, 470 F.2d 289 (8th Cir.), *cert. denied*, 412 U.S. 931 (1972), in which the Eighth Circuit Court of Appeals held that, although NEPA requires agencies to evaluate objectively

I am also troubled by two other aspects of the majority opinion. First, I am distressed because I believe the majority opinion fails to inform the Commission in precise terms what it must do in order to comply with the court's ad hoc standard of review.[6] The majority sends the waste storage issue back to the Commission for a "thorough ventilation." This language, of course, means very little in procedural terms. In order to aid the Commission in filling in the gaps in the record, the majority enumerates a number of procedural alternatives in varying degrees of formality, some less intrusive into agency prerogatives than others. Majority 39. Then, heeding the Supreme Court's admonition in *FPC v. Transcontinental Gas Pipe Line Corp.*, 96 S.Ct. 579 (1976) (per curiam), that we may not, except in extraordinary circumstances, specify agency procedures on remand, the majority declines to give the Commission any direction as to which procedure or combination of them, will suffice. The Commission is thus left to decide which to adopt, further confused by the majority's statement that, "It may be that no combination of the procedures mentioned above will prove adequate, and the agency will be required to develop new procedures to accomplish the innovative task of implementing NEPA through rulemaking." Majority 39. Such specificity resembles a

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their projects, it does not require agency officials to be subjectively impartial. In other words,

> NEPA assumes as inevitable an institutional bias within an agency . . . and erects the procedural requirements of § 102 to insure that there is no way the decision-maker can fail to note the facts and understand the various arguments advanced by the plaintiffs if he carefully reviews the entire environmental impact statement.

Id. at 295 (quotation marks and citation omitted).

[6] Judicial imposition of procedural requirements on an ad hoc basis is criticized in Wright, *supra*.

standardized test in which there are numerous possible answers, including "all of the above," "none of the above," or "various combinations of the above." The result, I believe, is entirely predictable: the Commission may or may not adopt one of the majority's suggestions, but will in any case seek to comply by mechanically generating more "negative" information respecting current problems with disposal of high level radioactive wastes and then will "overcome" this information with citations to favorable studies and articles. Ultimately, of course, the Commission must decide which information to accept and which to reject, regardless of the type of procedure used. The majority opinion appears to recognize as much when it volunteers that, "On the other hand, the procedures the agency adopted in this case, if adminstered in a more sensitive, deliberate manner, might suffice." Majority 40 (citation omitted). This time, however, the decision whether licensing an additional reactor is worth the additional environmental risk would be one of policy or risk assessment and, consequently, would be reviewable only according to the customary "arbitrary, capricious" standard. *Amoco Oil Co. v. Environmental Protection Agency*, 501 F.2d 722, 741 (1974). I believe it almost inevitable that, after fully considering the problems and alternative methods of waste disposal and storage, the Commission will reach the same conclusion and therefore see little to be gained other than delay from imposing increased adversarial procedures in excess of those customarily required.[7]

[7] It has been argued that those cases in which we have granted a limited right of cross-examination on remand have afforded little relief other than delay and a tool with which to bargain for substantive concessions. Williams, *"Hybrid Rulemaking" Under the Administrative Procedure Act: A Legal and Empirical Analysis*, 42 U. CHI. L. REV. 401, 436-48. It would seem, therefore, that the right of cross-examination at a rulemaking proceeding frequently is better to have and be denied than to utilize.

This brings me to my second, related concern with the majority's approach. I believe the majority's insistence upon increased adversariness and procedural rigidity, uneasily combined with its non-direction toward any specific procedures, continues a distressing trend toward over-formalization of the administrative decision-making process which ultimately will impair its utility. As Judge Wright has recently noted, the administrative response to overuse of judicial imposition of such ad hoc procedural refinements is easily foreseeable. Fearing reversal, administrators will tend to over-formalize, clothing their actions "in the full wardrobe of adjudicatory procedures," until the advantages of informal rulemaking as an administrative tool are lost in a heap of judicially imposed procedure. Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 CORNELL L. REV. 375, 387-88 (1974).[8] The majority's

[8] A further problem with over-reliance on the hybrid rulemaking approach has its roots in the hostility of some judges to all forms of substantive review of agency decisions. The line between substantive and procedural review is, of course, a hazy one. The same judges who most vehemently protest against judicial intrusions into the substance of administrative action, especially in highly technical areas, may not hesitate to require relatively more procedure of an agency when they dislike its substantive result. There is, I believe, a danger that judges will feel less restrained in requiring agencies to adopt procedures in excess of those required by the APA when review is couched in procedural, rather than substantive, terms. The preoccupation of the majority opinion in this case with the half-life of the plutonium atom and the myriad of geological and other technical difficulties one faces in attempting to safely store a highly toxic substance for a quarter of a million years demonstrates that judges cannot avoid the task of immersing themselves in difficult and often technical matters in order to evaluate administrative action and assure themselves that the agency has in fact dealt with all major issues. Because the relative environmental importance of the waste disposal issue before us is the subject of some

reliance upon the so-called "hybrid rulemaking" cases[9] for its conclusion that the procedures prescribed by section 553 are inadequate for resolution of the complex issues involved in this case and its insistence that the Commission adopt more formal adversary procedures are, I believe, misplaced. Admittedly, there are rare cases in which "basic considerations of fairness" require procedures more adversarial than those prescribed by section 553. *See* Majority 14-15, *quoting from* Respondent's Brief at 13-14. I cannot agree, however, that this case requires us to reach this issue. Remanding an agency decision with instructions to initiate such procedures is an extraordinary judicial remedy which, I believe, should be reserved for extraordinary cases.

The appropriate remedy at this point is not to impose ad hoc procedural requirements in an attempt to raise the level of petitioners' participation, already adequate under section 553, but to remand for an explanation of the basis of Dr. Pittman's statements and of the staff's numerical conclusions,[10] *i.e.* for the documentation which the majority finds so conspicuously lacking.[11] The

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controversy, arguments about whether our focus here is "procedural" or "substantive" may be more semantic than determinative.

[9] *See* the cases cited at note 23 of the majority opinion.

[10] As the majority states, due process considerations probably mandate that petitioners be allowed to comment upon any additional information assembled by the Commission. Neither the Constitution nor the Administrative Procedure Act, however, directs the Commission to allow additional oral presentation, cross-examination, or any other procedures in addition to those required by section 553.

[11] The extent of the required statement of basis may vary, of course, according to the precise demands and issues of each particular case, but, "[a]t a minimum, the statement should refer to relevant submissions by interested parties and should

Commission should be able to supply the court with a statement of the methods by which its staff arrived at the figures embodied in Table S-3 and by which Dr. Pitt-

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rebut or accept these submissions in an orderly fashion." Wright, *supra* at 381. This court has also distinguished between factual determinations and policy choices more peculiarly within the expertise of the administrative agency. In the former case, we commonly have insisted upon sufficient attention to the facts to enable the reviewing court to ascertain the underlying rationality of the resultant regulations. Amoco Oil Co. v. Environmental Protection Agency, 501 F.2d 722 (D.C. Cir.), *cert. denied*, 417 U.S. 921 (1974). In contrast,

> [w]here . . . the regulations turn on choices of policy, on an assessment of risks, or on predictions dealing with matters on the frontiers of scientific knowledge, we will demand adequate reasons and explanations, but not "findings" of the sort familiar from the world of adjudication.

Id. at 741.

Often, of course, an agency ruling will encompass both factual determinations and policy choices. This is such a case. For example, the decision to treat the waste storage issue through generic rulemaking because it is common to all licensing decisions is clearly a policy determination within the agency's special expertise which we should review only for clear abuse of discretion. *See* NLRB v. Bell Aerospace Co., 416 U.S. 267 (1974). The decision to license a particular reactor is also a policy or "assessment of risks" decision within the agency's discretion, provided it has adequately considered all underlying factual issues, including the waste storage issue, and has determined to its own satisfaction that safe methods of production and waste storage are already technologically and economically feasible. Finally, once so assured, the decision to postpone until later the question as to which of several feasible methods should be utilized is also, I believe, a policy, or risk assessment, decision.

This case, however, involves related factual determinations for which we must find support in the statement of basis required by section 553. Of particular relevance here is Table S-3, which reduces the environmental effect of licensing an additional reactor to certain numerical values and, in ef-

man concluded that the waste storage problem is already technologically and economically soluable. If it cannot, then we will have no choice but to invalidate the Commission's rule under the "arbitrary, capricious" standard; if it can, we should defer to the administrative weighing of risks and benefits of additional reactors.

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fect, concludes that it is negligible. The claimed bases for the judgments expressed in numerical terms in Table S-3 are the data assembled by the staff in the draft Environmental Survey, adopted without substantial modification as Table S-3 and thus embodied in the final rule. As the majority indicates, neither the Survey itself, the back-up documentation to which it refers, nor the oral and written testimony offered at the hearing adequately supports these factual conclusions with respect to the waste disposal issue. Majority 21-22. The detailed explanation which characterizes other portions of the Environmental Survey is notably absent from this portion.

UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 74-1385

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.,
Petitioners

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION
AND THE UNITED STATES OF AMERICA
Respondents

VERMONT YANKEE NUCLEAR POWER CORP.,
Intervenor

No. 74-1586

NATURAL RESOURCES DEFENSE COUNCIL, INC.
AND CONSOLIDATED NATIONAL INTERVENORS,
Petitioners

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION
AND UNITED STATES OF AMERICA
Respondents

BALTIMORE GAS AND ELECTRIC CO., ET AL.
Intervenors

Filed October 8, 1976

Before: Bazelon, Chief Judge; Edwards*, U.S. Circuit Judge for the Sixth Circuit and Tamm, Circuit Judge.

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*Sitting by designation pursuant to Title 28 U.S. Code Section 291(a).

ORDER

Upon consideration of the motion of respondents United States Nuclear Regulatory Commission and United States of America for stay of mandate and for correction of this Court's opinion dated July 21, 1976, and of petitioners' opposition thereto, and movants having called to the attention of the Court certain portions of the transcript of the hearing on February 1, 1973, which portions were omitted from the Joint Appendix, it is

ORDERED, by the Court, that respondents' motion for correction of this Court's opinion dated July 21, 1976, is granted in part, and the opinion dated July 21, 1976 is amended as follows:

On page 34, delete lines 3-5.

On page 34, delete footnote 53 and renumber all succeeding footnotes.

On page 41, delete the following from footnote 59: "In this case the board members asked no questions whatsoever of Dr. Pittman. *See supra* note 53."

In all other respects, respondents motion for correction is denied.

Per Curiam

Notice: This opinion is subject to formal revision before publication in the Federal Reporter or U.S. App. D.C. Reports. Users are requested to notify the Clerk of any formal errors in order that corrections may be made before the bound volumes go to press.

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 73-1776

NELSON AESCHLIMAN, ET AL., PETITIONERS

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION AND UNITED STATES OF AMERICA, RESPONDENTS

CONSUMERS POWER CO., A MICHIGAN CORP., INTERVENOR

No. 73-1867

SAGINAW VALLEY NUCLEAR STUDY GROUP, UNITED AUTO WORKERS INTERNATIONAL, CITIZENS COMMITTEE FOR ENVIRONMENTAL PROTECTION OF MICHIGAN, WEST MICHIGAN ENVIRONMENTAL ACTION COUNCIL, INC., SIERRA CLUB AND UNIVERSITY OF MICHIGAN ENVIRONMENTAL LAW SOCIETY, PETITIONERS

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION AND UNITED STATES OF AMERICA, RESPONDENTS

CONSUMERS POWER COMPANY, INTERVENOR

Petitions for Review of Orders of the Nuclear Regulatory Comission

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Argued November 27, 1974

Decided July 21, 1976

Myron M. Cherry, with whom *Robert L. Graham*, was on the brief for petitioners in No. 73-1867 argued for all petitioners.

James L. Kelley, Attorney, Nuclear Regulatory Commission, with whom *Wallace H. Johnson*, Assistant Attorney General, *Marcus A. Rowden*, General Counsel, Nuclear Regulatory Commission, *Raymond M. Zimmet*, Assistant to the Solicitor, Nuclear Regulatory Commission. *Edmund B. Clark*, *Jacques B. Gelin* and *Lawrence E. Shearer*, Attorneys, Department of Justice, were on the brief for respondents.

Harold F. Reis, with whom *J. A. Bouknight, Jr.*, was on the brief for intervenor Consumer Power Company.

Howard J. Vogel, was on the brief for petitioners in No. 73-1776.

William H. Ward, filed a brief on behalf of the State of Kansas as *amicus curiae* urging reversal.

Before: BAZELON, *Chief Judge*, FAHY, *Senior Circuit Judge* and JUSTICE,* *United States District Judge* for the Eastern District of Texas

Opinion for the Court filed by *Chief Judge* BAZELON.

BAZELON, *Chief Judge*: These cases involve consolidated petitions for review of orders of the U.S. Atomic Energy Commission granting construction permits for two pressurized water nuclear reactors to generate electricity and steam.[1]

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* Sitting by designation pursuant to 28 U.S.C. § 292(d).

[1] Under the Energy Reorganization Act of 1974, Pub. L. No. 93-438, 88 Stat. 1233, 42 U.S.C. § 5801 *et seq.* (Supp. IV, 1974), the licensing and related regulatory functions of the AEC were transferred to the U.S. Nuclear Regulatory Commission [NRC]; the Energy Research and Development Administration [ERDA] assumed responsibility for the operation of government nuclear research and production facilities. 42 U.S.C. §§ 5841(f), 5842, 5814(c) (Supp. IV, 1974). We employ the term "Commission" to refer to both AEC and its regulatory successor, NRC.

The applicant, Consumers Power Company [Consumers] made its initial application in January, 1969, under the Atomic Energy Act of 1954, as amended, 42 U.S.C. §§ 2133, 2232, 2235, and 2239. Consumers' own system is the primary customer of electricity, while the adjacent facility of the Dow Chemical Company [Dow] was the intended customer of the output of process steam. Location of the twin reactors in Midland, Michigan, across the Tittabawassee River from Dow was dictated, in part, by the fact that steam does not efficiently retain heat over long travels.

Petitioner Aeschliman and five other residents of nearby Mapleton, Michigan, constituting the Mapleton Intervenors, opposed grant of the permits. Similarly in opposition were petitioning organizations, Saginaw Valley Nuclear Study Group, a local not-for-profit environmental organization, et al. [Saginaw].

As required by 42 U.S.C. §§ 2039, 2232(b), the application was referred to the Advisory Committee on Reactor Safeguards [ACRS], and to the Commission staff. In 1970, both ACRS and the staff preliminarily concluded that the facility comported with the Atomic Energy Act's public health and safety standards.

After notice and hearings,[2] a three-member Atomic

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[2] Seventeen days of hearings were held regarding health and safety issues. Dow and a local civic organization intervened on behalf of the application; the Mapleton and Saginaw intervenors opposed it. Under then-prevailing Commission rules, environmental issues did not have to be considered in a construction permit hearing, and were excluded. On the final day of hearings, this court decided *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC*, 499 F.2d 1109 (D.C. Cir. 1971),

Safety and Licensing Board issued a lengthy decision authorizing issuance of construction permits. Mapleton and Saginaw intervenors filed exceptions with the Atomic Safety and Licensing Appeal Board. Upon review, the Appeal Board affirmed in all respects, but attached conditions concerning the applicant's "quality assurance" program.[3]

Following the filing of petitions for review, motions seeking reconsideration on various grounds were made and denied.[4]

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striking down the Commission regulations governing treatment of NEPA issues. Thereafter, the Commission revised its environmental review regulations, and in January, 1972, issued its draft environmental impact statement on the Midland facility. Comments were solicited from federal agencies, groups in the vicinity of the proposed site, and the public. A final environmental impact statement followed in March, 1972. Fourteen days of public hearings on environmental issues were conducted in May and June, 1972. Saginaw did not participate in these latter hearings, but both Mapleton and Saginaw did submit proposed findings of fact and conclusions of law.

[3] The terms "quality assurance" and "quality control" are terms of art defined by 10 C.F.R., Part 50, App. B:

> '[Q]uality assurance' comprises all those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to the physical characteristics of a material, structure, component, or system which provides a means to control the quality of the material, structure, component, or system to predetermined requirements.

[4] These cases have been long delayed. The last decision on the merits by the Appeal Board was rendered May 18, 1973. On July 10, 1973, the Commission declined review. *See* 10 C.F.R. § 2.785(d)(1) (1975). The petitions for review were filed August 6, 1973. On November 6, 1973, the Commission declared a major change in policy regarding energy conserva-

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A.

Saginaw argues the Environmental Impact Statement [EIS] for construction of the Midland reactors did not adequately consider "alternatives to the proposed action" as required by §§ 102(C)(iii) and 102(D) of the National Environmental Policy Act [NEPA], 42 U.S.C. §§ 4332(C)(iii); *id.*, (D) (1970). In particular, Saginaw asserts the EIS was fatally defective for failure to examine energy conservation as an alternative to a plant of this size. The alternatives section of the EIS discusses several non-nuclear methods of power generation, but does not consider any measures for reducing consumer demand.[5] This omission was forcefully pointed out by

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tion. Niagara Mohawk Power Corp., RAI-73-11, 995. Petitioners sought clarification by the Commission of the impact of *Niagara* on parallel contentions in their case. This court delayed briefing to permit resolution of that question, and finally ordered the Commission to respond to petitioner's request. The Commission refused to reopen on January 24, 1974. Petitioners made a second motion before the Commission to reopen the matter on the ground that renegotiation of the Consumers-Dow agreement substantially altered elements of the cost-benefit analysis which had permitted construction. That motion was denied on February 5, 1974, and a third, which the Commission deems cumulative with the second, was denied on February 20, 1974. On April 11, 1974, after calling for all relevant contracts, the Commission again affirmed its decisions not to reopen for changed circumstances, noting that Dow still intended substantial takes of electricity and steam, and intended to maintain their fossil-fuel facilities, "primarily on a stand-by basis." These cases were argued together on November 27, 1974. On April 8, 1975, this court entered an order holding them in abeyance pending the decision in NRDC v. NRC, Nos. 74-1385, 74-1586 (D.C. Cir., decided today), which governs certain of the issues. See, *infra* III.

[5] III J.A. XI-1—XI-11.

Saginaw in its comments on the draft EIS.[6]

The Licensing Board rejected energy conservation alternatives as "beyond our province," stating the "real question" was which power generating technology would be superior.[7] On administrative appeal, the Licensing

[6] *See, e.g.*, III J.A. 128, ¶ 47 (promotional advertising); *id.*, 129-30, ¶ 48 (rate structure); *see also id.*, 150, ¶ 87 (air conditioner usage); *id.*, 149, ¶ 85 (generalized need to conserve energy resources).

We need not decide what the result would be if energy conservation had not been brought to the Licensing Board's attention. We note, however, that several courts have considered intervenor's comments to be one factor bearing on the reasonableness of agency discussion of alternatives. Sierra Club v. Morton, 510 F.2d 813, 826 (5th Cir. 1975); North Carolina v. FPC, —— F.2d ——, No. 74-1941 (D.C.Cir. March 24, 1976), slip op. at 9, *petition for cert. filed*, 44 U.S.L.W. 3671 (U.S., May 14, 1976) (No. 75-1657). *Cf.* Maryland-Nat. Capital Park & Planning Comm. v. U.S. Postal Service, 487 F.2d 1029, 1040 n.9 (D.C.Cir. 1973) (whether exhaustion doctrine applies to NEPA left open).

[7] The Licensing Board wrote:

> 48. Intervenors have suggested at various times that the Board must go behind the characterization of "demand" made by the Applicant to determine whether an appropriate alternative to satisfying the demand would be to set limits on particular uses of electricity. The Board declines to do so. So far as appears from the record, the postulated demand is made up of normal industrial and residential use and it is, in our view, beyond our province to inquire into whether the cusomary uses being made of electricity in our society are "proper" or "improper". The suggestion was also made that Applicant is stimulating demand by its advertising. No evidence was offered on this point and absent some evidence that Applicant is creating abnormal demand, the Board did not consider the question.

II J.A. 38.

* * * *

[Continued]

Board's decision not to explore conservation alternatives was affirmed. The Appeal Board held that conservation was implicitly considered in the cost-benefit analysis and demand projections, and that in view of Saginaw's failure to introduce evidence, further discussion was not required under the "rule of reason" enunciated in *NRDC* v. *Morton*, 458 F.2d 827 (D.C.Cir. 1972).[8]

[7] [Continued]

> 70. As noted above, the Board is satisfied that the benefits outweigh the costs. The real question comes with respect to alternatives. Assuming that the power needs are to be met, are there better alternatives? The evidence demonstrates that there are no hydro sites available, that a pumped storage facility would not meet the load needs, that gas is not a viable alternative for power use, and that outside sources are unavailable. (Citation omitted.) The question of alternatives is then boiled down to a choice between nuclear and fossil (either oil or coal) fuel at the proposed location or at some other location.

II J.A. 53-4.

[8] The text of the Appeal Board's discussion of these issues was as follows:

> 3. Saginaw Intervenors . . . contend, in effect, that the Licensing Board should have considered . . . [*inter alia*] the alternative of not constructing the plant at all . . . or embarking on a program to conserve energy; the environmental propriety of the proposed uses of electricity; and the alleged artificial stimulation by advertising of the demand for electricity.
>
> a. Most of these effects and alternatives were in fact considered by the Board. . . . The alternative of not building the plant at all is inherently part of the cost-benefit analysis which was carried out by the Board. . . .
>
> Some of the intervenor's contentions in these exceptions seek to expand the NEPA review well beyond the pale of what we view as required by NEPA. Thus, while the scope of NEPA consideration of alternatives clearly extends beyond those which an agency itself may effectuate (see *Natural Resources Defense Council* v. *Morton*,

Shortly after the Appeal Board decision, the Commission held in Niagara Mohawk Power Corp., RAI-73-11-995 (Nov. 6, 1973), that certain energy conservation issues should be considered in licensing proceedings. Saginaw thereupon appealed to the Commission for "clarification" of the Appeal Board's decision in light of *Niagara*.

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458 F.2d 827 (D.C.Cir. 1972)), a rule of reason nevertheless applies. *Id.* at 837. Contrary to intervenors' view, and giving effect to that rule, the Board was not required to analyze the use to which Consumers' customers might put the power generated by the Midland plant to ascertain whether that use would have an adverse environmental impact. The Board made a finding that the "postulated demand is made up of normal industrial and residential use" and that it need not inquire into the propriety of such customary uses of electricity. We agree.

. . . .

b. As for the contention that the demand for electricity was artificially stimulated by the applicant's advertising, the Board stated that no evidence had been offered to support that contention; and that absent some evidence that applicant was creating abnormal demand, it [the Board] would not consider the question. We do not believe the Board acted unreasonably.

In re Consumers Power Co., ALAB-123, RAI-73-5-331 at 351-52 (May 18, 1973), I J.A. 38-39. [Footnotes and citations omitted.]

Unfortunately, discussion of energy conservation by both Licensing and Appeal Boards was obscured by conflating two separate arguments advanced by the intervenors. In addition to arguing NEPA required consideration of energy conservation alternatives, the intervenors argued that the alleged "benefits" of the plant should be discounted by the environmental harm which would be done by the products manufactured from the power generated. In particular, the intervenors focused on certain alleged carcinogens produced by the Dow Chemical Co., a large potential customer of the Midland plant. *See, e.g.*, Saginaw Environmental Contentions ¶ 34, III J.A. 118. This "end product" argument is not pressed on appeal.

The Commission responded that before Licensing Boards need explore energy conservation alternatives, intervenors "must state clear and reasonably specific energy conservation contentions in a timely fashion. Beyond that, they have a burden of coming forward with some affirmative showing if they wish to have these novel contentions explored further." In re Consumers Power Co., RAI-74-1-19 at 32 (Jan. 24, 1974), I J.A. 71. The "affirmative showing" required was further elaborated as follows:

> Purported energy conservation issues must meet a threshold test—they must relate to some action, methods or developments that would, in their aggregate effect, curtail demand for electricity to a level at which the proposed facility would not be needed. . . . Beyond that, the issue must pertain to an alternative that is "reasonably available." *Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 834 (C.A.D.C. 1972). [Footnote omitted.] Furthermore, the impact of proposed energy conservation alternatives on demand must be susceptible to a reasonable degree of proof. Largely speculative and remote possibilities need not be weighed against a convincing projection of demand. Here, as with many other issues under the National Environmental Policy Act of 1969, a rule of reason applies. See *Natural Resources Defense Council* v. *Morton*, *supra*.

Id., 24, I J.A. 63. Measured by these standards, the Commission held Saginaw's comments on energy conservation "fell far short."[9] Saginaw had introduced no

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[9] *Id.*, 32, I J.A. 71. The Commission does appear to have found one of Saginaw's contentions sufficient to raise an issue under *Niagara*. It related to possible revision of rates by state public utility commissions to discourage increased consumption of electricity. *See id.*, 26-27, I J.A. 65-66. The Commission disposed of this point by declaring "we will not apply *Niagara* retroactively to cases which had progressed to final

evidence demonstrating the feasibility of particular methods of energy conservation, much less evidence indicating that the proposed facility could be eliminated entirely.[10]

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order and issuance of construction permits before *Niagara* was decided." *Id.*

Admittedly, agencies sometimes apply changes in their discretionary interpretations of their governing statutes only prospectively in order to avoid unfairness to those who have relied on prior pronouncements. *See* Retail Store Union v. NLRB, 466 F.2d 380, 390 (D.C.Cir. 1972); NLRB v. Majestic Weaving Co., 355 F.2d 854, 860-61 (2d Cir. 1966). But that power cannot be stretched to permit disavowal of clear obligations a statute such as NEPA imposes on the agency itself. The Commission had no power to dispense with such consideration of energy conservation as NEPA required as of the time it was enacted in 1969, at least in those cases where the issue had been raised. *See supra* note 6.

[10] Contrary to the Commission's formulation, an alternative cannot be ignored simply because it would not *totally* alleviate the need for a proposed facility:

> . . . Nor is it appropriate, as Government counsel argues, to disregard alternatives merely because they do not offer a complete solution to the problem. If an alternative would result in supplying only part of the energy that the [proposal] would yield, then its use might possibly reduce the scope of the . . . program and thus alleviate a significant portion of the environmental harm attendant on [it].

NRDC v. Morton, 458 F.2d 827, 836 (D.C.Cir. 1972). *See also* NRDC v. Callaway, 524 F.2d 79, 93 (2d Cir. 1975) (EIS must discuss "such alternatives to the proposed action as may *partially* or completely meet the proposal's goal") [emphasis added].

It is sufficient that energy conservation might reduce projected demand for electricity so that a smaller facility, having lesser adverse environmental impact, would be adequate.

B.

Saginaw contends that the "threshold test" applied in this case is inconsistent with NEPA's "basic mandate" to the Commission to "take the initiative" in considering environmental issues. *Calvert Cliffs' Coordinating Comm., Inc.* v. *AEC*, 449 F.2d 1109, 1118-19 (D.C.Cir. 1971). We agree.

In *Calvert Cliffs* the Commission proposed to limit consideration of environmental issues under NEPA to those "which parties affirmatively raise." *Id.*, 1118. This court reversed, pointing out "it is unrealistic to assume that there will always be an intervenor with the information, energy, and money required" to investigate environmental issues. *Id.* The court held that the "primary responsibility" for fulfilling NEPA must lie with the Commission, which may not merely "sit back, like an umpire, and resolve adversary contentions at the hearing stage."[11] *Id. See also Greene County Planning Board* v. *FPC*, 455 F.2d 412, 420 (2d Cir.), *cert. denied*, 409 U.S. 849 (1972). The same considerations persuade us that the Commission may not refuse to consider energy conservation alternatives unless an intervenor first brings forward information satisfying the strictures of its "threshold test."

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[11] The Commission acknowledged in its opinion that "NEPA imposes upon us an affirmative obligation to develop an adequate record upon which to assess the environmental impact of proposed nuclear plants." RAI-74-1-19 at 31, I J.A. 70. However, the Commission felt it "must nevertheless have workable subsidiary rules for the orderly conduct of these proceedings." *Id.*

The Commission has substantial discretion in the selection of procedures. *See* Siegel v. AEC, 400 F.2d 778, 786 (D.C. Cir. 1968). However, we do not believe the asserted interest in orderly proceedings goes so far as to justify the heavy substantive burdens placed on intervenors, contrary to *Calvert Cliffs*.

The Commission derived the "threshold test" from the "rule of reason" courts use in reviewing the sufficiency of the alternatives considered in an EIS. *NRDC* v. *Morton*, 458 F.2d 827, 834 (D.C.Cir. 1972). *See also Carolina Environmental Study Group* v. *U.S.*, 510 F.2d 796, 800-801 (D.C.Cir. 1975); *NRDC* v. *Callaway*, 524 F.2d 79, 92 (2d Cir. 1975). Thus, for example, agencies are not required to consider alternatives which are "remote and speculative," *Life of the Land* v. *Brinegar*, 485 F.2d 460 (9th Cir. 1973), *cert. denied*, 416 U.S. 961 (1974), but may deal with circumstances "as they exist and are likely to exist." *Carolina Environmental Study Group* v. *U.S.*, *supra*, 510 F.2d at 801.

The Commission properly recognized that such judgments present mixed questions of law and fact which can only be intelligently resolved based on a factual record.[12] But the need to assemble data bearing on whether alternatives are promising enough to merit detailed consideration in the EIS does not mean the entire burden of compiling such information can be placed on the intervenors. In light of the allocation of responsibility established by *Calvert Cliffs*, we believe the Commission erred in promulgating a "threshold test" which essentially requires intervenors to prove an alternative satisfies the "rule of reason" before the Commission will investigate it.

In our view, an intervenor's comments on a draft EIS raising a colorable alternative not presently considered

[12] The decision that a technological or other development is a "realistic" alternative which merits full consideration in an EIS ought not turn on the intuition of "technically illiterate" judges that it is "reasonable." *Cf.* Ethyl Corp. v. EPA, No. 73-2205 (D.C.Cir. March 19, 1976) (en banc) (Bazelon, C.J., concurring). Nor, of course, should factual submissions bearing on the "reasonablenss" of alternatives be presented to the court in the first instance. *Cf.* Camp v. Pitts, 411 U.S. 138 (1973).

therein must only bring "sufficient attention to the issue to stimulate the Commission's consideration of it."[13] Thereafter, it is incumbent on the Commission to undertake its own preliminary investigation of the proffered alternative sufficient to reach a rational judgment whether it is worthy of detailed consideration in the EIS. Moreover, the Commission must explain the basis for each conclusion that further consideration of a suggested alternative is unwarranted. An explicit statement is essential to enable the parties to challenge the agency's action through motions for reconsideration, and to facilitate judicial review. The preliminary investigation of an alternative to determine whether it merits further consideration need not be nearly as detailed as that required regarding alternatives which are considered in the EIS. Often a short explanation will suffice.[14] It is not "oner-

[13] The phrase is drawn from our recent decision in Indiana & Michigan Elect. Co. v. FPC, 502 F.2d 336, 339 (D.C.Cir. 1974), *cert. denied*, 420 U.S. 946 (1975), a case concerned with the requirements of § 313(b) of the Federal Power Act, 16 U.S.C. § 825*l*(b) (1970), that objections be presented in an application for rehearing. The form of words used is not all important. The Commission's opinion in this case suggested a standard which would probably suffice as well: a "showing . . . sufficient to require reasonable minds to inquire further." RAI-74-1-19 at 32 n.27, I J.A. 71. This does not, however, support the imposition of the burden of an affirmative evidentiary showing.

[14] A suggested alternative may be essentially redundant, or merely a minor variation of approaches already considered. Or preliminary investigation may indicate that it is impractical, or that meaningful information regarding it is not available.

Where the discussion of alternatives in an EIS is "sufficient to permit a reasoned choice," NRDC v. Morton, *supra*, 458 F.2d at 836, "an EIS does not become vulnerable because it fails to consider each and every conceivable variation of the alternatives stated." Brooks v. Coleman, 518 F.2d 17, 19 (9th Cir. 1975).

ous" for an agency, as well as a court, to state its reasons "if the matter was dealt with in a conscientious manner in passing on the merits." *See Davis* v. *Clark*, 404 F.2d 1356, 1358 (D.C. Cir. 1968) (separate opinion of Tamm, J.).

C.

In the instant case, Saginaw's comments were adequate to "stimulate the Commission's consideration" of energy conservation alternatives. Saginaw identified in a general way the measures it believed merited consideration, and their relationship to the objectives of the project. Of course, if energy conservation generally were already being considered in an EIS, more detailed comments might be required to focus the Commission's attention on specific techniques. *See North Carolina* v. *FPC*, *supra* note 6.

Energy conservation was clearly a "colorable" alternative relevant to the goals of the project. The FPC routinely requires that applications to build hydroelectric facilities include an environmental report discussing "the potential for accomplishing the proposed objectives through energy conservation" as well as through alternative energy sources. 18 C.F.R. App. A § 8.2 (1975), 38 Fed. Reg. 15946, 15949 (June 19, 1973). Moreover scholars and government officials are almost unanimous that energy conservation will have an important, although not decisive, role in overall energy policy in coming decades.[15] It follows that energy conservation was

[15] *See, e.g.*, Nuclear Energy, Report of the 15th American Assembly (April 22-25, 1976), at 5. This three day symposium on the future of nuclear energy brought together 62 eminent participants from government, industry and the academic community under the auspices of Columbia University. The group reached a general consensus on the following conclusions, *inter alia*:

not to be dismissed by the Commission without inquiry or explanation.

Nor are we persuaded by the argument advanced by the Appeal Board that energy conservation was implicitly considered in the cost-benefit analysis or demand projections. *See supra* p. 7. In enacting §§ 102(C)(iii) and 102(D) of NEPA Congress required *explicit* consideration of "alternatives to the proposed action." Express consideration of other approaches to a problem places a proposed action in perspective for both the immediate decisionmaker and the public.[16]

2. Although there was considerable sentiment that overall energy growth rate should be cut down through more efficient use and conservation of energy, it was felt that some growth, possibly as low as 1.5 percent, annually, but probably higher, would occur. For electric power demand, it was felt that although the growth rate would probably be less than the "historic" growth rate of 7 percent, it was unlikely to be less than 5 to 5.5 percent, in view of the need to substitute electrical energy for some present uses of oil and gas.

3. Substantial savings can and should be made through energy efficiency improvements and a strong conservation program. Savings through voluntary action alone, although important, are likely to be limited. Some mandatory controls are essential, despite undoubted difficulties in administering such controls effectively and fairly. Market factors will have some impact, especially on commercial and industrial consumption, but they should be supplemented by tax and other incentives. In the case of individual consumption evidence to date suggests energy demands in the United States may not be strongly dependent on price in the short-run.

[16] *Cf.* EDF v. Corps. of Engineers (Tennessee-Tombigbee), 492 F.2d 1123 (5th Cir. 1974), in which the court rejected the suggestion that alternatives need not be considered where the environmental benefits of a project outweigh its costs. The court stated: "the Congressional mandate to develop alternatives would be thwarted by ending the search for other

We hold that rejection of energy conservation on the basis of the "threshold test" was capricious and arbitrary for the reasons heretofore stated. Remand for further proceedings on this and other issues discussed hereafter is therefore necessary.

II

A.

Saginaw also contends that the Commission erred by refusing to permit inquiry into the safety conclusions of the Advisory Committee on Reactor Safeguards [ACRS]. ACRS is a group of outside experts charged by statute to "make reports . . . with regard to the hazards of proposed or existing reactor facilities and the adequacy of proposed reactor safety standards." 42 U.S.C. § 2039 (1970). *See Siegel* v. *AEC*, 400 F.2d 778, 780 (D.C.Cir. 1968). Pursuant to 42 U.S.C. § 2232(b), each application for a construction permit or operating license for a commercial nuclear power generating facility must be reviewed by ACRS and a report "made . . . available to the public except to the extent that security classification prevents disclosure." *Id.*

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possibilities at the first proposal which establishes an ecological plus, even if such a positive value could be demonstrated with some certainty." *Id.*, 1135.

Demand projections based on historical growth rates are not an adequate substitute for explicit consideration of alternatives such as energy conservation. *Cf.* Carolina Environmental Study Group v. U.S., *supra*. There petitioners argued the EIS should have discussed "at greater length the alternatives of no power, less power, and other means of power generation." 510 F.2d at 800. Although the court had already concluded "Duke's prior forecasts of future demand" had been extremely accurate, *id.*, the court found it necessary to go on to examine the discussion of alternatives in the EIS, *id.*, 801, and found it adequate under the "rule of reason" in the circumstances therein.

The ACRS report in this case was a 5 page, single-spaced typewritten letter. In language accessible to the determined layman, the ACRS report discusses roughly half a dozen design problems raised by the Midland reactors, and recommends modifications to alleviate them."[11] Following discussion of these specific problems, the ACRS report concludes:

> *Other problems* related to large water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee

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[11] IV J.A. 93-98. Changes suggested by ACRS are almost always voluntarily adopted by the applicant. While ACRS *approval* (as opposed to scrutiny) is not required by law before a license issues, "in practice it is very unlikely that an applicant would persist in going before [the Licensing Board] over their objection." Union of Concerned Scientists v. AEC, 499 F.2d 1069, 1073 n.5 (D.C.Cir. 1974).

An example of the nature of the ACRS report is the following:

> The Committee has commented in previous reports on the development of systems to control the buildup of hydrogen in the containment which might follow in the unlikely event of a major accident. The applicant proposes to make use of a technique of purging through filters after a suitable time delay subsequent to the accident. However, the Committee recommends that the primary protection in this regard should utilize a hydrogen control method which keeps the hydrogen concentration within safe limits by means other than purging. The capability for purging should also be provided. The hydrogen control system and provisions for containment atmosphere mixing and sampling should have redundancy and instrumentation suitable for an engineered safety feature. The Committee wishes to be kept informed of the resolution of this matter.

IV J.A. 97.

A supplemental ACRS report was also prepared several months later addressing several additional problems. IV J.A. 99-100.

> believes that resolution of these items should apply equally to the Midland Plant Units 1 & 2.
>
> The Committee believes that the above items can be resolved during construction and that, if due consideration is given to these items, the nuclear units proposed for the Midland Plant can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public.

IV J.A. 97-98 [emphasis added].

Pointing out that it could not determine what "[o]ther problems" the ACRS had in mind, or what "resolution" of them it had suggested, Saginaw requested the Licensing Board to permit discovery into these matters. Saginaw's discovery requests took the form of 337 interrogatories, various document demands, subpoenas, and requests for depositions directed to ACRS members. These requests were all denied, for essentially two reasons. First, it was stated that "the ACRS letter is only admitted as part of the record to show compliance with the statutory requirements . . . ." RAI-74-5-331 at 340. Second, the Commission had indicated in another case that it would be inappropriate to probe the reasoning of individual ACRS members. *Id.*, 340 & n. 62.

We agree with Saginaw that further explication of the ACRS report was necessary, but agree with the Commission that discovery from individual ACRS members was not the proper way to obtain it.

B.

The role Congress intended for ACRS clearly emerges from its legislative history. In 1957, ACRS was added to the Atomic Energy Act of 1954 by Pub.L. 85-256, 71 Stat. 579. Prior to that time, the Commission had established its own "Committee on Reactor Safeguards." *See* S.Rep. No. 296, 85th Cong., 1st Sess., 1957 U.S.Code

Cong. & Admin. News 1803, 1813 [hereafter USCCAN]. However, in 1956, the Commission issued the construction permit litigated in *Power Reactor Development Co.* v. *Int'l Union of Elect. Workers*, 367 U.S. 396 (1961), despite an adverse committee report which had not been made public. *See Union of Concerned Scientists* v. *AEC*, 499 F.2d 1069, 1073 n.5, 1075 n.13 (D.C.Cir. 1974). Aroused by this incident, Congress gave ACRS an independent statutory existence and required that its reports be made public. *Id.*

The Commission opposed making a public ACRS report a "formal statutory requirement." USCCAN at 1816. However, noting the "great prestige" and credibility which the Reactor Safeguards Committee enjoyed in the eyes of the public, the Joint Committee on Atomic Energy stated:

> The report of the [ACRS] committee is to be made public *so that all concerned may be apprised of the safety or possible hazards of the facility.* It is the belief of the Joint Committee that when the public is adequately and accurately informed that it will be in a better position to accept the construction of any reactors.

USCCAN 1825, 1826 [emphasis added]. The statute established ACRS "as part of the administrative procedures in chapter 16 of the act" to provide the "same type of scrutiny and prestige" as the Reactor Safeguards Committee had in the past. USCCAN at 1825. As part of its mandate, ACRS also was to "advise the Commission with respect to the hazards involved at any facility" and to "insure that any features of new reactors would be as safe as possible." *Id.*

The ACRS report in this case must be evaluated in light of the congressional purposes. While the reference to "other problems" identified in previous ACRS reports

may have been adequate to give the Commission the benefit of ACRS members' technical expertise, it fell short of performing the other equally important task which Congress gave ACRS: informing the *public* of the hazards. At a minimum, the ACRS report should have provided a short explanation, understandable to a layman, of the additional matters of concern to the committee, and a cross-reference to the previous reports in which those problems, and the measures proposed to solve them, were developed in more detail. Otherwise, a concerned citizen would be unable to determine, as Congress intended, what other difficulties might be lurking in the proposed reactor design. Since the ACRS report on its face did not comply with the requirements of the statute, we believe the Licensing Board should have returned it *sua sponte* to ACRS for further elaboration of the cryptic reference to "other problems." [18]

Turning to the propriety of discovery directed to individual ACRS members and ACRS documents, we conclude it was not error to deny these requests. ACRS' unique role as an independent "part of the administrative procedures in chapter 16 of the act," *supra*, is sufficiently analogous to that of an administrative decisionmaker to bring into play the rule that the "mental processes" of such a "collaborative instrumentalit[y] of justice" are not ordinarily subject to probing. *United States* v. *Morgan*, 313 U.S. 409, 422 (1941). This rule is particularly apropos in light of ACRS's collegial composition such that no individual may speak for the group as a whole. Where an ACRS report on its face omits material

[18] This is not to say that an ACRS report must contain detailed factual findings of the kind necessary to aid judicial review. Under Commission rules, when ACRS conclusions are controverted, a factual record is compiled anew before the Licensing Board. *See* 10 C.F.R., pt. 2, App. A, V(f)(1) (1976).

information, the appropriate course is not discovery but to return it for supplementation. *Cf. Dunlop* v. *Bachowski*, 421 U.S. 560, 574-75 & n. 11 (1975). We merely hold here that neither the Atomic Energy Act nor general principles of administrative law required the Commission to grant Saginaw's discovery requests.[19]

On remand, the ACRS report should be returned to the ACRS for clarification of the ambiguities noted above.

III

The fuel cycle issues in these cases are controlled by *Natural Resources Defense Council* v. *United States Nuclear Regulatory Commission*, —— F.2d ——, Nos. 74-1385 & 74-1586, (D.C.Cir., decided today). The final EIS prepared in regard to Midland plant units 1 & 2 says only that fuel wastes will be shipped to unidentified offsite disposal areas. On remand, the Commission shall undertake appropriate consideration of waste disposal and other unaddressed fuel cycle issues, and restrike the cost-benefit analysis, as necessary, in accordance with *NRDC* v. *NRC*, *supra*.

As this matter requires remand and reopening of the issues of energy conservation alternatives as well as recalculation of costs and benefits, we assume that the Commission will take into account the changed circumstances regarding Dow's need for process steam, and the intended continued operation of Dow's fossil-fuel generating facilities.[20]

[19] The case as presented calls upon the court to make no decision whether the Federal Advisory Committee Act, 5 U.S.C. App. I § 10(b) (Supp. III, 1973), entitles a party upon proper request to have access to data which were before the ACRS.

[20] This court has previously addressed factors to be considered in reanalysis of costs and benefits in the context of a

IV.

Petitioners' other contentions must be rejected for lack of support in the record, or because prior decisions have concluded the issue unfavorably to petitioners.[21] The

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derating license amendment calling for continued operation at a lower level:

> An alternative to be considered is complete abandonment of the project, just as it was at both the construction and full-power operating license stages. [citation to record omitted]. As at those stages, sunk costs are not appropriately considered costs of abandonment, although replacement costs may be if construction of a substitute facility could reasonably be expected as a consequence of abandonment.

Union of Concerned Scientists v. AEC, 499 F.2d 1069, 1084 n.37 (D.C.Cir. 1974).

[21] We conclude that the Appeal Board's treatment of the "quality assurance" and "quality control" requirements was adequate, and, particularly in light of the considerations and conditions set out in its orders, should not now be set aside.

The question of the propriety of using a generic rulemaking proceeding to determine standards governing Emergency Core Cooling Systems (for all like reactors) has been concluded unfavorably to petitioners by Union of Concerned Scientists v. AEC, 499 F.2d 1069 (D.C. Cir., 1974).

Mapleton Intervenors raise alleged weaknesses in the final EIS concerning data on the fogging and icing problems caused by the facility's proposed 880-acre cooling pond. Here, the Licensing Board directed, and the Appeal Board affirmed, I J.A. 47, applicant Consumers to conduct a study of fogging and icing in its required ecological surveillance program. The Commission is free to reassess this problem on remand, but it has received sufficient study that the court is not impelled to order that it be done.

With respect to petitioners' complaint that inadequate attention has been given to the possibility of a Class 9 breach of containment or other accident, *see* Carolina Environmental Study Group v. United States, 510 F.2d 796, 799-800 (D.C. Cir. 1975); Ecology Action v. United States Atomic Energy Commission, 492 F.2d 998, 999 (2nd Cir. 1974).

orders granting construction permits for the Midland reactors are hereby remanded for further proceedings in conformity with our opinion.

So ordered.

DOCKET No. 50-271

ALAB-56

IN THE MATTER OF VERMONT YANKEE NUCLEAR POWER CORPORATION (VERMONT YANKEE NUCLEAR POWER STATION)

Issued June 6, 1972

ATOMIC SAFETY AND LICENSING APPEAL BOARD:
SIDNEY G. KINGSLEY, *Chairman.*
DR. JOHN H. BUCK.
DR. LAWRENCE R. QUARLES.

MEMORANDUM AND ORDER

During the course of extended hearings for the issuance of an operating license for this nuclear power station,[1] the Atomic Safety and Licensing Board has referred to us on December 29, 1971, under Subsection 2.730(f) of the Rules of Practice, 10 CFR Part 2, certain rulings concerning the scope of environmental review under 10 CFR Part 50, Appendix D, as revised September 9, 1971.[2]

The referral by the Licensing Board does not explicitly identify the questions to which it seeks answers. It cites the Board's rulings at certain pages of the transcript. Those rulings refer in general terms to proceedings which we have sought out in the record.

[1] The provisional construction permit was issued on December 11, 1967.

[2] 36 Fed. Reg. 18071. See also 36 Fed. Reg. 18716, September 21, 1971; 36 Fed. Reg. 19153, September 30, 1971; 36 Fed. Reg. 21579, November 11, 1971; 36 Fed. Reg. 23900, December 16, 1971; 37 Fed. Reg. 864, January 20, 1972; 37 Fed. Reg. 9619, May 13, 1972; 37 Fed. Reg. 9779, May 17, 1972.

The referral originated in a motion of the intervenors Natural Resources Defense Council, Inc. (NRDC). It has two principal aspects:

a. The Board has referred to us oral rulings in which it sustained objections to questions and to interrogatories concerning the levels of radioactivity and the associated hazards which might be included in the operations of a reprocessing plant to which irradiated fuel from the Vermont Yankee plant might ultimately be sent for reprocessing, and the transportation of high level radioactive wastes from such a reprocessing plant to an ultimate storage area.

b. The Board has also referred a motion of NRDC which requested that, under Subsection 2.785(d) of the Rules of Practice, the substantive questions be certified to the Atomic Energy Commission on the asserted ground that a broad policy question is involved which should be determined by the Commission.

The original motion of NRDC sought orders of the Licensing Board which would open for consideration in the proceeding the environmental impact of spent fuel transportation and reprocessing, the disposition and ultimate storage of high level wastes, and the disposal of the contaminated structures of the nuclear generating station at the end of its useful life when it is decommissioned.

The Licensing Board denied the motion of NRDC, which, after the decision in *Calvert Cliff's Coordinating Committee, Inc.* v. *Atomic Energy Commission,* 449 F.2d 1109 (D.C. Cir. 1971), presented its "Renewed Motion . . . for Full Consideration of Waste Handling Issues", for orders directing the staff to prepare a new detailed statement on environmental considerations, directing the applicant to respond to certain related specific interrogatories, and permitting NRDC to introduce evidence by direct testimony and cross-examination of witnesses. The motion was supported by the intervenor New England Coalition on Nuclear Pollution.

We consider at the outset the request that the Appeal Board certify to the Commission the substantive questions which are now in issue.

Under paragraph 2.785(a)(1) of its Rules of Practice, 10 CFR Part 2, the Commission has delegated to the Appeal Board the authority and the review function which would otherwise be exercised and performed by the Commission itself. See 36 Fed. Reg. 3837, 3838, February 27, 1971. Having been given the responsibility of relieving the Commission of this burden, it is our obligation to carry it out, subject to the Commission's review, unless we conclude that we are incapable of doing so without prejudice to the Commission's performance of its duties. See *1969 Annual Report, Administrative Conference of the United States,* pp. 17, 38-39. If the Commission in its wisdom should conclude that it should review on its own motion a decision or action of this Appeal Board, it will doubtless exercise its reserved power to do so. 10 CFR Section 2.786.

The motion of NRDC and the related rulings of the Licensing Board raise the question of the scope of Appendix D of Part 50 of the Commission's regulations. Appendix D is patterned upon the language of Section 102 of the National Environmental Policy Act of 1969, P.L. 91-190, 43 U.S.C. 4321 *et seq.* The Commission initially published Appendix D as an interim statement of general principles and procedures under that Act (35 Fed. Reg. 18469, December 4, 1970; see also 35 Fed. Reg. 5463, April 2, 1970). After the decision of the United States Court of Appeals for the District of Columbia Circuit in *Calvert Cliffs' Coordinating Committee* v. *Atomic Energy Commission,* 449 F.2d 1109 (July 23, 1971), it published a revised Appendix D (36 Fed. Reg. 18071, September 9, 1971).

The issues presented by the NRDC motion and the referred rulings, as they now lie before this Appeal Board,

appear to be whether the Licensing Board is to consider the environmental hazards of transporting and reprocessing spent fuel from the facility, transporting and disposing of the high level wastes issuing from reprocessing, transportation and storage of low level wastes, and ultimate disposal of the contaminated structures of the facility itself at the end of its useful life; and whether the detailed environmental impact statement prepared by the staff must address each of these issues.

We have concluded that the Licensing Board should consider the transportation of spent fuel to a reprocessing plant, and the transportation from the nuclear power plant of high level wastes as well as of low level wastes, but should not consider in this proceeding operations of a reprocessing plant or the disposal of wastes resulting from reprocessing. We have also concluded that the environmental effects to be addressed by the staff should extend to and be limited to the same scope.

During the course of the proceeding NRDC has served voluminous interrogatories on various subjects, including radioactive wastes and their disposal. The applicant has answered almost all of them, but has declined to answer two concerning reprocessing and the disposal of wastes from a reprocessing plant. The staff's draft detailed statement on environmental considerations, which has been filed since the Licensing Board's referral to us, has taken into account the handling of radioactive wastes at the plant and the transportation of irradiated nuclear material and solid radioactive waste from the plant.

Section A of Appendix D, 10 CFR Part 50, which prescribes the scope of the subject matter of the environmental study to be conducted in implementation of paragraph 102(2)(C) of the National Environmental Policy Act, de-

fines that subject matter in the same language as paragraph 102(2)(C), 42 U.S.C. 4332(2)(C):

> "(i) the environmental impact of the proposed action,
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
> (iii) alternatives to the proposed action,
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

The applicant has included in its environmental study the transportation of irradiated fuel from the reactor to a fuel reprocessing plant, as well as the transportation of packaged radioactive material from the reactor to burial grounds for low level wastes. It has done so pursuant to a memorandum of September 1, 1971, distributed by the Director of Regulation by means of a circular letter of September 3, 1971. The memorandum of September 1 was not a regulation adopted and published in accordance with Section 4 of the Administrative Procedure Act, 5 U.S.C. 553. It was a guide (see 36 Fed. Reg. 22851, n. 1, (1971) which did not establish a definitive regulatory requirement, but merely represented a solution considered acceptable as complying with requirements otherwise imposed.[3]

We conclude that the exclusion of the reprocessing function and its resulting wastes from the environmental study

[3] If a statement of policy is intended to have binding effect, it is a "rule" (Sec. 2(c). Administrative Procedure Act, 5 U.S.C. 551(4)) which becomes effective when adopted pursuant to the procedures of Section 4, *National Labor Relations Board* v. *Wyman-Gordon Co.*, 394 U.S. 759, 763–765 (1969); *Texaco, Inc.* v. *Federal Power Commission*, 412 F.2d 740 (3d Cir. 1969); *National Motor Freight Traffic Association* v. *United States*, 268 F. Supp. 90 (D.C. 1967), aff d 393 U.S. 18 (1968); *Seaboard World Airlines, Inc.* v. *Gronouski*, 230 F. Supp. 44 (D.C. 1944); *Devcon Corp.*, 70 F.T.C. 1780, 20 Ad. L. 2d 292 (1966).

required by paragraph 102(2)(C) and by Appendix D of Part 50 is consistent with the purposes of the Environmental Policy Act and Appendix D and is proper.

Congress has directed in the Environmental Policy Act that an agency follow certain procedures in its decision making, and take into account the specified environmental factors; but it has not prescribed that any particular result shall follow when those factors have been taken into account.[4]

Whether the Environmental Policy Act and Appendix D of Part 50 should be so construed that the environmental study to be accomplished in this individual reactor licensing proceeding is to be extended to the reprocessing of fuel elements in a reprocessing plant and the disposition of waste resulting from that process requires examination of the relation of this reactor to the reprocessing function against the background of the nature, size and structure of the nuclear industry. We may take official notice of these general circumstances as descriptive of the nuclear industry at large.[5]

There are well over 100 commercial central station nuclear plants which are operable, under construction, or on order; more than 20 of these are already operating under license, about 40 have been granted construction permits and are in the course of operating license proceedings, about 15 more have been granted construction permits, and ap-

[4] *Calvert Cliffs' Coordinating Committee* v. *Atomic Energy Commission*, 449 F.2d 1109, 1112, 1115 (D.C. Cir. 1971); *Committee for Nuclear Responsibility* v. *Seaborg*, 463 F.2d 783 (1971), 3 E.R.C. 1126 (D.C. Cir. Oct. 5, 1971); *Upper Pecos Association* v. *Stans*, 452 F.2d 1233 (10th Cir. 1971).

[5] 10 C.F.R. Sec. 2.743(i); *Attorney General's Manual on the Administrative Procedure Act*, 79–80; *Davis, Administrative Law Treatise*, Vol. 2 and 1970 Supp., Secs. 15.03–15.06.

proximately another 40 are in construction permit proceedings. *Nuclear Industry 1971,* U.S. Atomic Energy Commission, 81. In addition to chemical reprocessing facilities operated by the Commission, three commercial reprocessing plants are in operation or under construction, and at least one other may be built in the near future. *Id.*, 133-136.

The record indicates that none of the nuclear fuel in the Vermont Yankee reactor will be replaced or reprocessed until 18 months after the commencement of operation, when about 4 percent of the fuel assemblies will be replaced. It is expected that about 40 percent of the fuel assemblies will be replaced 12 months later, and that 25 to 30 percent will be replaced each 12 months thereafter. As assemblies are removed from the reactor they will be stored in a storage pool at the site for 3 or 4 months at least, until they are shipped to a reprocessing plant. The spent fuel will be transported, under contracts to be let by Vermont Yankee, in heavily shielded casks by truck or rail, under applicable regulations of the Atomic Energy Commission (see e.g., 10 CFR Parts 70, 71, 73) and of the Department of Transportation (49 CFR Parts 172, 173).

Aside from the spent fuel, the wastes which will be generated at the plant will consist largely of slightly contaminated water treatment resins and such miscellaneous slightly contaminated items as rags, floor sweepings, worn-out equipment and paper. A small portion of the resins, amounting to about 65 cubic feet per year, will be slightly higher in activity and will be transported in appropriately designed and shielded casks, probably by tractor-trailer.

We recognize that there will be an incremental environmental effect ultimately resulting from the operation of this reactor as the result of the operation of whatever reprocessing plants and disposal grounds may from time to time be used during the life of the plant. There is no way

of ascertaining now which of the various reprocessing plants now in existence or to be constructed will from time to time receive some irradiated fuel elements from this plant for reprocessing during its estimated 40-year life. Reprocessing plants do not all use the same method of chemical separation of fissionable materials from the wastes, and there is no reason to believe that during the useful life of the Vermont Yankee plant other methods will not be developed for that purpose.

Each reprocessing plant which has been and will be constructed is a "production facility" within the meaning of Paragraph 50.2(a)(3) of the Commission's regulations (10 CFR Part 50). In the interest of the protection of the public health and safety and the national security, each has been or will be subjected to full review under 10 CFR Part 50 and other pertinent regulations through the procedures established in 10 CFR Part 2 for such a facility. Each plant not yet licensed will be subjected to full environmental review as a part of the Commission's licensing action under Paragraph 102(2)(C) of the Environmental Policy Act (10 CFR Part 50, App. D, par. A.1) — the procedure which NRDC now seeks, in effect, to invoke in this licensing proceeding for those same facilities *en masse*. The procedures are already in course for two reprocessing plants which are under construction or awaiting operation.[8]

The scope of the inquiry required by Paragraph 102(2)(C) is repeatedly defined by the language of that section and as reflected in the language of Appendix D, as the impact, the consequences and the alternatives of "the proposed action", which in the present case is the licensing of a specific nuclear power reactor. The language of Section 102 directs that the environmental statement shall be

[8] *Matter of General Electric Company* (Docket No. 50-268); *Matter of Allied Gulf Nuclear Systems, Inc.* (Docket No. 50-332).

accomplished "to the fullest extent possible". But "the proposed action" is the licensing of the Vermont Yankee reactor and not of other present and future facilities at other places, to be operated by other firms, and having at best a contingent and presently indefinable relation to this facility. Paragraphs A.3, A.4, and A.8 of Appendix D repeatedly refer to the environmental impact of "the facility" as defining the scope of the analysis. Paragraph A.10 refers to "the proposed licensing action", meaning the licensing of the particular facility which is before the Licensing Board and before us in a specific proceeding.

It is evident to us that evaluation of the environmental effects of the operation of one or more unidentifiable reprocessing plants, employing separation processes which are unidentified and which may or may not now be known or used, during the course of the forty-year life of the plant, is not possible at this time and in this proceeding. If the fuel elements of the Vermont Yankee plant pass through the process stream of one reprocessing plant or another now operating or to operate in the future, preceded and followed by the fuel elements and their constituents from other plants, we cannot see how any effect of that process on the environment, taking into account the factors enumerated in Subsection 101(b) and Section 102 of the Environmental Policy Act, 42 U.S.C. Subsection 4331(b), 4332, can be analyzed except as a part of the integrated analysis of the total operation of that specific reprocessing plant. This analysis will be conducted for each reprocessing plant to be built in connection with the licensing of that plant as a "facility". Any reprocessing plant now in existence, if not already required to be subject to environmental review (see 10 CFR Part 50, App. D, Section B, Section C, and paragraphs A.1, A.8, and A.14) will be subject to review before any modification is permitted which, in the language

of Paragraph 102(2)(C), is one "significantly affecting the quality of the human environment."

No one has indicated, and we are unable to perceive, any significant respect in which the Vermont Yankee plant will have any different relation from any other nuclear power station to the reprocessing part of the fuel cycle. The logical consequence of the position of NRDC is that in every reactor licensing proceeding it would be required by Paragraph 102(2)(C) that there be an environmental analysis of the operation of every reprocessing plant, present and future, to which its nuclear fuel might be sent for reprocessing. We cannot believe that this was the intent of Congress in directing that there be an environmental analysis in each case of "the proposed action".

In specifying the scope of the environmental analysis prescribed by Paragraph 102(2)(C) as applicable to nuclear facilities, Appendix D has reflected the guidance of the Council on Environmental Quality,[7] which has been designated by Congress in Subsection 102(B) and Title II of the Environmental Policy Act, 42 U.S.C. 4342, as the consultant to insure appropriate consideration of environmental amenities and values.

The conclusion we reach is consistent with the "Guidelines of the Council on Environmental Quality for Statements on Proposed Federal Actions Affecting the Environment" (36 Fed. Reg. 7724, 1971). Although the "actions" subject to the Guidelines "are not limited to" those enumerated explicitly in Paragraph 5, it is evident on reading the Guidelines as a whole that each environmental impact statement should be about a specific "project . . . involving a Federal . . . license" (e.g. par. 5(a)(ii), 5(b)) or a specific

[7] See 35 Fed. Reg. 18469, December 4, 1970; 36 Fed. Reg. 18071, September 9, 1971.

"action" (par. 6(a)(i)(iii)(iv)). The Guidelines do not contemplate that the comprehensive environmental review of every "project" or "action" is required to include other "projects" or "actions". They thus speak of the effect of the proposed change upon "the area in question". (Par. 6(a)(ii); *cf.* pars. 9, 10). The "project . . . involving a Federal . . . license" (par. 5(a)(ii)) which we have before us is the operation of the Vermont Yankee reactor.

We are not concerned here with a situation in which a single "project" or "action" by the agency is being fragmented (*Named Individual Members of San Antonio Conservation Society* v. *Texas Highway Department*, 446 F.2d 1013 (5th Cir. 1971)), but one in which we are simply called upon to ascertain the scope of the environmental review to be conducted in this proceeding by defining the "action" in which the agency is engaged.

The staff's voluminous draft detailed impact statement on the environmental considerations relating to the proposed issuance of the Vermont Yankee operating license, which has been filed under the Guidelines of the Council on Environmental Quality and the Commission's Appendix D, will be referred for comment to other Federal agencies and State and local officials. The draft detailed statement includes, among other things, consideration of the radioactive wastes to be produced, the waste treatment and waste handling systems, and the transportation of and disposition of solid radioactive wastes. It also considers the ultimate decommissioning and decontamination of the plant. The inclusion of these subjects in the staff's draft statement, with such further evidence as may be admitted and the Licensing Board's findings and conclusions under Appendix D, will dispose of so much of the motion of NRDC as relates to them.

It should not be assumed that the environmental effects of the handling and disposition of wastes are being neglected. The Commission has issued a guide for the submission of information for the evaluation of the environmental effects of facilities (37 Fed. Reg. 10013, 1972), and the development of these detailed criteria is continuing. Under Section 202 of the Atomic Energy Act, 42 U.S.C. 2252, the Commission is required to keep the Joint Committee on Atomic Energy "fully and completely informed with respect to all of the Commission's activities", and the Joint Committee is required to conduct and has conducted continuing studies of the activities of the Commission. The transportation and disposition of high level wastes have repeatedly been the subject of testimony before the Joint Committee, and have at times been the subject of extended hearings.[8]

The adoption of NRDC's position could as a practical matter call a halt to the licensing of individual reactors. No power reactor could be licensed until every present and future reprocessing plant was studied in some depth — a process that would in turn, we presume, be asserted to involve every present and future power reactor in order to determine just what wastes would pass through each reprocessing plant. The operation of a reprocessing plant and the disposition of its wastes can and should be evaluated in the licensing proceeding for each reprocessing plant. "Each action" and "each project" and its environmental effects will thus be considered in depth in the appropriate proceeding which will best disclose the elements to be

[8] See *e.g.*, Hearings, Industrial Radioactive Waste Disposal, January 28–30, 1959, February 2–3, 1959, July 29, 1959; Hearings Environmental Effects of Producing Electric Power, October 28–31, 1969, November 4–7, 1969, January 27–30, 1970, February 24–26, 1970; see also Selected Materials on Environmental Effects of Producing Electric Power, Joint Committee on Atomic Energy, 91st Cong., 1st Sess., August 1969.

weighed. Each such proceeding will provide "a useful point at which public pressure can be placed". F. S. Cohen, *Field Theory and Judicial Logic,* 59 Yale L.J. 238, 251-2 (1959). For a particular nuclear reactor, analysis will thus be in its own individual proceeding, such as this one; for a particular reprocessing plant, analysis will be conducted in its own licensing proceeding with consideration of all the circumstances on the basis of which its particular environmental effects can be intelligently considered: its location, surroundings, design, processing method, capacity, and similar individual characteristics. Only in this way can the purposes of the Environmental Policy Act be sensibly and effectively served.[9]

Our careful study of the opinion of the Court of Appeals for the District of Columbia Circuit in *Calvert Cliffs' Coordinating Committee, Inc.* v. *Atomic Energy Commission,* 449 F.2d 1109 (1971), does not lead us to any different conclusion. Notwithstanding strong language in that case on

[9] The Administrative Conference of the United States has recommended reasonable limitation of alternatives to be considered in licensing procedures (Recommendation No. 15. Consideration of Alternatives in Licensing Procedures, 1969 Annual Report, Administrative Conference of the United States (1970), 45:

"Court decisions, notably *Scenic Hudson Preservation Conference* v. *FPC,* [354 F.2d 608 (2d Cir. 1965), *cert. denied,* 384 U.S. 941 (1966)] have emphasized that in licensing cases the Federal Power Commission must explore and give proper consideration to possible alternatives to the specific plan proposed by the applicant. This principle may in the future be applied to other licensing agencies. Since the range of possible alternatives in any case can be extensive and in some cases virtually unbounded, ways must be sought to control the scope and duration of licensing proceedings within manageable limits while meeting the requirements of the law.

"RECOMMENDATION

"Each agency which issues licenses . . . should seek to create procedures fitting its particular circumstances which will assure appropriate consideration of alternatives where necessary, and at the same time will permit effective administration of that agency's licensing functions."

the issues there presented, the Court's observations are addressed to the environmental study of "the proposal" or "the proposed action", in the language of the Environmental Policy Act, and to "a particular project" (449 F.2d at 1114, 1123).

In *Natural Resources Defense Council, Inc.* v. *Morton,* 458 F.2d 827, 3 E.R.C. 1558 at 1563, 1564 (January 13, 1972), the same Court has more recently pointed out that the required discussion of environmental effects need not be exhaustive, but is required only to extend to reasonable lengths:

"The statute must be construed in the light of reason if it is not to demand what is, fairly speaking, not meaningfully possible . . .".

• • •

"So long as the officials and agencies have taken the 'hard look' at environmental consequences mandated by Congress, the court does not seek to impose unreasonable extremes or to interject itself within the area of discretion of the executive as to the choice of the action to be taken."[10]

That the Court was unanimous in the views we have quoted is evidenced in the separate opinion of Judge MacKinnon (458 F.2d 827 at 839, 3 E.R.C. at 1565-1570).

Our conclusion is reinforced by *Scientists' Institute for Public Information, Inc.* v. *Atomic Energy Commission,* Order of Court (D.C. March 24, 1972), in which the Court rejected the claim that, in connection with the construction of a proposed experimental fast breeder reactor, the environmental review must extend beyond the specific reactor to the environmental effects of such reactors at large.

NRDC has asserted that it has no forum other than this proceeding in which the broad environmental studies it

[10] Citing the *Calvert Cliffs'* case.

seeks may be pursued. That is not the case. Each reprocessing plant has been and will be subject to the licensing procedures and standards established by the Commission's regulations, and in each such present and future proceeding a comprehensive analysis is being or will be made of its environmental effect. The Commission has procedures for rulemaking (10 CFR Part 2, Subpart H), under which the intervenors may by petition initiate rulemaking for the establishment of such regulations as they may choose to put forward. If in the judgment of the Commission it should be appropriate to resolve any specific questions which affect the industry as a whole, within the broad policy concerns which NRDC presents, then the rulemaking procedure is available.

Bearing in mind the purposes of the Environmental Protection Act, the Licensing Board will consider the extent to which the low level wastes, and the 65 cubic feet per year of resins which have a somewhat higher level of activity, will have an effect "significantly affecting the quality of the human environment" (National Environmental Policy Act of 1969, Sec. 102(2)(C), 42 U.S.C. 4332). In the exercise of the Licensing Board's discretion as to the extent to which evidence will be admitted or interrogatories allowed with reference to such subjects, it would be especially appropriate to limit inquiry to a level of detail appropriate to the character of the potential hazard associated with these wastes, so long as the Board has in its judgment an adequate basis for the required findings and conclusions (10 CFR Subsection 2.743(c)).

Evaluation of the environmental aspects of the ultimate depository of the high level wastes resulting from reprocessing is at this time speculative, because it has not yet been determined what the nature or the location of the ultimate depository will be. That project will also of course be subject to independent analysis and procedures in compliance with the Environmental Protection Act, and it cannot be the subject of appropriate evaluation in this proceeding.

The transportation of low level wastes to burial grounds was included within the scope of environmental review specified in the memorandum of the Director of Regulation dated September 1, 1971, and issued on September 3, 1971. Although that document does not have the effect of a binding regulation, we adopt it to that extent for the purposes of this proceeding. Since the operation of such burial grounds is licensed under other provisions of the Commission's regulations (10 CFR Part 30), the environmental aspects of each facility of that character may be considered in other proceedings.

The motion of NRDC included the request that the environmental study extend to the ultimate decommissioning and decontamination of the facility at the end of its useful life of about 40 years. The decommissioning and decontamination of power reactors have already been conducted within the framework of our licensing procedures, furnishing a practical basis for analysis.[11] The applicant has not opposed the inclusion of decommissioning and decontamination in the environmental study, the staff has considered it in its draft impact statement, and it may be considered in the Licensing Board's Findings and conclusions.

During the course of the hearing the Licensing Board raised the question that compliance with the objectives of the Environmental Policy Act does not explicitly fall within

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[11] *Matter of General Electric Company*, Docket No. 50-18; *Matter of Puerto Rico Water Resources Authority*, Docket No. 115-4; *Matter of City of Piqua, Ohio*, Docket No. 115-2.

the issues committed to the Licensing Board by the notice of hearing issued in this proceeding. This notice of hearing was superseded on March 1, 1972, with respect to environmental considerations by a supplemental notice of hearing which accomplished that purpose (37 Fed. Reg. 4733, (1972)).

Paragraph A(11) of Appendix D describes the functions to be performed by the Licensing Board with regard to the environmental statement and directs that its initial decision include findings and conclusions which may affirm or modify the contents of the final detailed statement prepared by the staff. The Licensing Board's findings and conclusions should of course be based upon all of the evidence before it (Administrative Procedure Act, Subsection 7(c), 5 U.S.C. 556(d)), and the evidence on which they will be based will very largely be in the record already. The extent to which further evidence may be required or appropriate is for the Board to determine in its discretion. The Board should allow such additional evidence as in its judgment is requisite to satisfy the purposes of the Environmental Policy Act and to support the findings and conclusions required by Appendix D, permitting only such additional evidence to be admitted as is in its judgment relevant, material, and reliable and not unduly repetitious (10 CFR Subsection 2.743(c)). The weight to be given to various environmental considerations is of course for the Board to consider.

It is therefore ORDERED:

1. So much of the motion of NRDC as requests that the substantive questions involved in the referral by the Atomic Safety and Licensing Board dated December 29, 1971, be referred to the Commission is denied;

2. Evidence as to the environmental effects of the transportation of irradiated nuclear fuel from the Vermont Yankee nuclear power plant to a reprocessing plant or other destination shall be admitted;

3. Evidence as to the environmental effects of the reprocessing of irradiated nuclear fuel, and the disposal of wastes resulting from reprocessing, shall not be admitted;

4. Evidence as to the environmental effects of the transportation of low level wastes, and of high level solid wastes other than irradiated fuel, from the reactor to depositories shall be admitted;

5. Evidence as to the environmental effects of the disposal of low and high level solid wastes shall not be admitted;

6. Evidence as to the environmental effects of decommissioning and decontamination of the facility at the end of its useful life shall be admitted;

7. The scope of the final environmental statement to be prepared by the staff, and of the findings and conclusions of the Licensing Board pursuant to 10 CFR 50, Appendix D, shall be consistent with the foregoing.

BY THE ATOMIC SAFETY AND LICENSING APPEAL BOARD,

WILLIAM L. WOODARD, *Executive Secretary.*

ALAB-179

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Dr. John H. Buck, Member
Dr. Lawrence R. Quarles, Member

In the Matter of

VERMONT YANKEE NUCLEAR POWER CORPORATION — Docket No. 50-271

(Vermont Yankee Nuclear Power Station)

Mr. Anthony Z. Roisman and Ms. Karin P. Sheldon, Washington, D.C., for the intervenor New England Coalition on Nuclear Pollution.

Messrs. Richard Ayres and David Schoenbrod, New York, N. Y., for the intervenor Natural Resources Defense Council, Inc.

Mr. Thomas G. Dignan, Jr., Boston, Mass. (with whom Messrs. Allen O. Eaton and John A. Ritsher, Boston, Mass., were on the brief) for the applicant Vermont Yankee Nuclear Power Corporation.

Mr. Donald W. Stever, Jr., Assistant Attorney General, Concord, New Hampshire, for the State of New Hampshire.

Mr. Gregor I. McGregor, Assistant Attorney General, Boston, Mass., for the Commonwealth of Massachusetts.

Messrs. Kimberly B. Cheney, Attorney General, and John R. Ponsetto, Assistant Attorney General, Montpelier, Vermont, filed papers for the State of Vermont.

Mr. William Massar (with whom Mr. Mark R. Haflich was on the brief) for the AEC Regulatory Staff.

DECISION

February 28, 1974

We have before us for review the initial decision of the Licensing Board authorizing the issuance of a full-term, full-power operating license for the applicant's Vermont Yankee Nuclear Power Station, a boiling water reactor facility located on the Connecticut River near Vernon, Vermont.[1] Exceptions to that decision were filed by the New England Coalition on Nuclear Pollution (NECNP) and the Natural Resources Defense Council (NRDC), two intervenors in the proceeding.[2]

After hearing oral argument on the exceptions and on certain matters which we raised *sua sponte*,[3] we determined that prompt action on our part was necessary with respect to two safety-related matters. For that reason, we issued an opinion dealing only with those two subjects. ALAB-124, RAI-73-5 358 (May 23, 1973). By that decision, we remanded the proceeding to the Licensing Board for further consideration of (1) NECNP's motion to reopen the record (2) and the adequacy of the applicant's quality assurance program.

Because our action created a real possibility that the hearing record would be reopened on a number of subjects and that the initial decision would be altered, we deferred review of the initial decision and the remaining exceptions pending the outcome of the remand (*id.* at 359). We need

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[1] LBP-73-8, RAI-73-2 130. The applicant had previously been granted a temporary operating license for the facility, under the then-existing authority conferred by § 192 of the Atomic Energy Act, 42 U.S.C. 2242.

[2] The other principal parties — the applicant, the AEC regulatory staff and three New England States — filed no exceptions.

[3] See ALAB-120, RAI-73-4 268 (April 26, 1973).

not recount here the events which transpired after the initial remand. Those events are reflected in the numerous opinions which we have issued in the interim.[4] For present purposes, it is sufficient to state that the hearing was reopened for consideration of the fuel densification issue, the plant was derated pending the outcome of that reopened hearing, and only recently was the fuel densification problem finally resolved, allowing once again for normal operations.

The matters which were the subject of remand now having been resolved, we complete our review of the initial decision in this opinion. By way of introduction, we can point out that NRDC's twenty-seven exceptions focus primarily upon the adequacy of the cost-benefit analysis mandated by the National Environmental Policy Act, while NECNP's sixteen exceptions cover a variety of topics.[5] Some of the principal issues raised have been largely disposed of by decisions we rendered either at earlier stages of this proceed-

[4] After the initial remand, we issued the following published opinions: ALAB-126, RAI-73-6 393 (June 7, 1973); ALAB-131, RAI-73-6 427 (June 25, 1973); ALAB-138, RAI-73-7 520 (July 25, 1973); ALAB-141, RAI-73-8 576 (August 22, 1973); ALAB-167, RAI-73-12 1151 (December 20, 1973).

[5] While we wish to commend all parties on the quality of the briefs filed, we were particularly impressed with the manner in which NECNP presented its exceptions and supporting brief. Although governed by the former version of the rules (see 10 CFR (1973 ed.) 2.762), those filings achieved in full measure the goals of clarity and precision which the present version of the rules is designed to accomplish (10 CFR 2.762, as amended March 2, 1973, 38 *F.R.* 5624). The exceptions avoided the unnecessary multiplicity which has been a problem in certain recent cases. Moreover, it materially aided our consideration of the exceptions and our understanding of the parties' positions to have the exceptions related to a common topic grouped for briefing, with the text of the exceptions repeated at the beginning of the relevant portion of the brief (*cf. Long Island Lighting Co.* (Shoreham Station), ALAB-156, RAI-73-10 831, 832 (October 26, 1973). The assistance provided by all of the briefs was especially important in light of the complete absence of record references in the initial decision.

ing[6] or in other cases. Accordingly, we give those issues summary treatment in the initial portion of this opinion, and cover the other issues in more depth in the remaining portions.

I

ISSUES COVERED BY PRIOR DECISIONS

The issues which have been largely resolved by our prior decisions include the adequacy of the emergency core cooling system (ECCS) interim acceptance criteria (IAC); the adequacy of the treatment in this proceeding of "Class 9" accidents; the environmental impact of the fuel cycle; and the environmental impact of the uses to which the electricity produced in this facility will be put.

A. *ECCS.* NECNP asserts that it should not have been precluded from presenting evidence on the question as to whether the ECCS interim acceptance criteria, "if met,"[7] would "provide sufficient protection for the public health and safety." This issue had its genesis in NECNP's attempt to challenge the validity of the criteria on the dual grounds that their adoption was procedurally defective and that they were substantively unsupported. In response to a set of questions certified to us during the course of the hearing below, we held that the procedural objections were not well founded and that, in view of the pendency of a rulemaking proceeding at which the merits of the criteria were

[6] Prior to the issuance of the Initial Decision on the full-power, full-term operating license, this Board issued a number of decisions in response either to questions certified by the Licensing Board or to decisions on less than full power or less than full term operating licenses.

[7] The question as to whether the facility met the criteria was explored at the hearing, and NECNP eventually conceded (see App. Bd. Tr. 40) that the criteria were met (absent the subsequently revealed effect of the fuel densification phenomenon).

under consideration,[8] it would be inappropriate to consider the substantive objections in an individual licensing proceeding. ALAB-57, WASH-1218 435 (June 20, 1972); see also *Consolidated Edison Co.* (Indian Point 2), ALAB-46, WASH-1218 293 (March 10, 1972).

We see no reason to reexamine these holdings. Specifically, we find unavailing NECNP's assertion that ALAB-57 ignored the then-existing "Calvert Cliffs" principle. That principle permitted limited attacks upon the substantive validity of Commission regulations in individual licensing proceedings and established a method for presenting such an attack.[9] In announcing the "Calvert Cliffs" principle, however, the Commission did not have before it a situation in which there was pending — as there is here — a rulemaking proceeding concerned with the precise regulation under attack. And nothing in that decision indicates that the principle there established should be invoked if rulemaking were pending. The reasons expressed in ALAB-57 are sufficient to explain why it was appropriate not to invoke the "Calvert Cliffs" rule in this instance.

While we are thus rejecting NECNP's ECCS exceptions (numbers 1 and 2) on their merits, the applicant insists that those exceptions are procedurally defective as well, in that they involve matters not raised or preserved below. The applicant asserts that a comparison of the exceptions with the wording of one of NECNP's proposed conclusions of law

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[8] That rulemaking proceeding was recently concluded by the Commission's issuance of a lengthy decision announcing the adoption of acceptance criteria for emergency core cooling systems. CLI-73-39, RAI-73-12 1085 (December 28, 1973).

[9] The "Calvert Cliffs" principle was first articulated in the Commission's memorandum decision of August 8, 1969 in *Baltimore Gas and Electric Co.* (Calvert Cliffs Units 1 and 2), — AEC —. That principle has since been substantially modified by 10 C.F.R. 2.758.

demonstrates that the exception has a different thrust than the matters raised before the Licensing Board.

We agree with the applicant that NECNP never properly presented a claim that this facility was somehow different from other plants and for that reason the application of the IAC to it would not adequately protect the public health and safety. NECNP's claims were only that the criteria themselves were generally invalid (see NECNP Motion of March 6, 1972, and Statement of March 7, 1972). By the same token, however, we cannot accept the applicant's further insistence that NECNP has waived *all* ECCS contentions. As just indicated, NECNP quite clearly attempted to challenge the validity of the IAC. This Board unequivocally rejected its challenge at an interlocutory stage of the proceeding. Once that occurred, NECNP was under no obligation to file proposed findings of fact and conclusions of law on the subject of its challenge to the criteria — no further steps had to be taken to preserve its exception to the ruling rejecting its challenge to the validity of the criteria. *Cf. Consumers Power Co.* (Midland Units 1 and 2), ALAB-123, RAI-73-5 331, 333-34 (May 18, 1973).

B. *"Class 9" Accidents.* NECNP's exceptions 6, 7 and 8 are all based on its contentions below that, for reasons related to asserted ECCS ineffectiveness, the assumptions underlying the analysis of the environmental impact of a "Class 9" accident were improper). We recently had occasion to discuss a similar "Class 9" accident argument in some detail. *Long Island Lighting Co.* (Shoreham Station), ALAB-156, RAI-73-10 831 (October 26, 1973). There, after fully defining the term "Class 9" (*id.* at 834-835), we explained that the guidelines for treatment of such accidents in individual licensing proceedings did not, in general, "close the door to consideration of Class 9 accidents" (*id.* at 835). Rather, we explained, the parties would be permitted to

demonstrate the appropriateness of assumptions other than that utilized by the staff in the first instance, *i.e.*, that the particular accident under consideration had such a low probability that the environment risk is insignificant (*ibid.*).

Again, however, this general rule cannot be relied upon to legitimize an attempt to demonstrate a likelihood that the ECCS will not work. For, once it has been established that the facility complies with the applicable ECCS criteria, entertaining such an attempt would be the equivalent of entertaining a challenge to the ECCS criteria themselves. As we have already indicated, all such challenges were required to be deferred for consideration in the rulemaking proceeding. ALAB-57, *supra*, p. 161-162; see also ALAB-156, *supra*, RAI-73-10 at 847.

C. *Fuel Cycle.* By virtue of a ruling of this Board, both NECNP and NRDC were precluded from adducing evidence concerning the environmental impact of the fuel cycle. ALAB-56, WASH-1218 395 (June 6, 1972).[10] We decline the invitation, presented by their exceptions, to reexamine the validity of the reasons assigned in ALAB-56 in support of our refusal to permit inquiry into the effect of most aspects of the fuel cycle. For, regardless of the correctness of those reasons, we would, for another reason, have to reach the same result if faced anew with the question.

Specifically, shortly after the issuance of ALAB-56, the Commission initiated a rulemaking proceeding to consider the extent of the environmental impact of the fuel cycle and to ascertain how to weigh that impact in an individual licensing proceeding. See the November 15, 1972 Notice of Proposed Rulemaking on the Environmental Effects of the

[10] See also *Consumers Power Co.* (Midland Units 1 and 2), ALAB-60, WASH-1218 (Suppl. 1) 459 (July 19, 1972).

Uranium Fuel Cycle (37 *F.R.* 24191). Whatever doubt there may have been concerning the correctness of the result reached in ALAB-56 has been eliminated by the convening of that rulemaking proceeding. Once that proceeding was initiated, it would have been singularly inappropriate to undertake to duplicate it in an individual reactor licensing proceeding. See ALAB-57, *supra*, WASH-1218 at 443-44.[11] Thus, even in the absence of the Commission's express directive that we adhere to ALAB-56 pending the outcome of the fuel cycle rulemaking (37 *F.R.* at 24193), we undoubtedly would have done so. For this reason, and for the reasons expressed in the two *Shoreham* opinions (ALAB-99, RAI-73-2 53 and ALAB-156, *supra*, RAI-73-10 at 833), the fuel cycle exceptions (NECNP number 3 and NRDC numbers 6(i), 20, 24 and 25) are denied.[12]

D. *Consequences of the Use of Electricity.* In *Shoreham*, we also held that the consequences of the use of electricity produced at a nuclear facility should not be considered in an individual licensing proceeding. The reasons for that holding were articulated in some detail and are dispositive of NECNP's exception 4 filed here. ALAB-156, *supra*, RAI-73-10 at 852-54. See also *Nucleus of Chicago Homeowners v. Lynn*, — F. Supp. — , 6 E.R.C. 1094 (N.D. Ill., Nov. 21, 1973).

[11] The rulemaking proceeding is also a far more appropriate forum for the consideration of the environmental impact of the fuel cycle than is a proceeding concerned with the licensing of a particular reprocessing plant or waste disposal facility (*Cf.* ALAB-56, WASH-1218 at 404-06).

[12] NRDC's exception 27 touches on an aspect of the fuel cycle — i.e., transportation of spent fuel from the reactor to a reprocessing facility — concerning which inquiry may be made in an individual licensing proceeding. See ALAB-99, *supra*, RAI-73-2 at 54. Nothing in the unparticularized argument in support of that exception (Brief, p. 33), however, points to any "alternatives to 'normal' transportation procedures" which could "reduce the environmental risks" (*ibid.*). The exception is denied.

II

LOW-LEVEL RADIOACTIVE EMISSIONS

A. Two of NECNP's exceptions (numbers 9 and 10) concern the question of whether plant operations can be expected to comply with the requirement, embodied in 10 CFR 20.1(c), that "every reasonable effort" be made to maintain radioactive releases "as far below the limits specified in [Part 20] as practicable."[13] NECNP's claim that the staff and the applicant did not perform analyses adequate to demonstrate that releases would be kept "as low as practicable" focuses on two time periods: (1) an interim period prior to the scheduled installation of an improved off-gas system, and (2) the period thereafter, extending over the remaining life of the license.

With respect to short-term operation, NECNP argues that the Licensing Board misinterpreted the applicable regulation when it concluded that a "reasonable effort" consisted of promising to investigate the higher-than-expected releases which had occurred during operations under the temporary operating license while continuing to operate the plant. Turning to long-term operation, NECNP argues that the studies necessary to determine whether, on balance, the optimum system for control of radioactive releases had been chosen have never been performed. Accordingly, it urges, the record provides no basis for a determination as to whether the "as low as practicable" criterion has been met.

[13] A supplementary requirement, covering only facilities for which applications were filed after January 1, 1971, utilizes the terminology "as low as practicable." 10 CFR 50.34a(a). Both that term and the term used in 10 CFR 20.1(c) are defined as meaning "as low as is practicably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety and in relation to the utilization of atomic energy in the public interest." For convenience, and since both forms of expression have the same meaning, we use the shorter form — "as low as practicable" — in this opinion.

B. The Commission first formally adopted the "as low as practicable" requirement on December 3, 1970 (35 *F.R.* 18385). It later initiated a rulemaking proceeding to consider whether to adopt numerical standards, embodied in a proposed Appendix I to 10 CFR Part 50, which might define precisely a level of radioactive releases would be deemed to be "as low as practicable" in all cases (37 *F.R.* 11113, June 9, 1971).

In contrast to the course followed in connection with the ECCS rulemaking, the Commission did not require that there be adherence to any numerical guidelines during the pendency of the "as low as practicable" rulemaking proceeding, which is now in its final stages.[14] Thus, in the interim, it has been permissible to contend in an individual licensing proceeding not only that a proposed radwaste system will not perform as well as is claimed, but also that the level of releases which the system is claimed to achieve is not "as low as practicable" considering "the state of technology and the economics of improvement in relation to benefits . . ." (see fn. 13, *supra*). In other words, in the absence of interim numerical guidelines and until such time as Appendix I may be adopted, a contention that a proposed level of releases is not "as low as practicable" does not constitute an impermissible challenge to the regulations (compare our ECCS rulings, discussed at pp. 161-162, *supra*); instead, such a contention raises questions only of interpretation and application of the governing regulations.[15]

[14] On January 8, 1974, the rulemaking hearing board informed the Commission that the record was complete except for the filing of the participants' final statements of position. The last of those statements is due in early March, 1974.

[15] Of course, any claim that releases must be kept below "practicable" levels — *e.g.*, a claim that an available radwaste system improvement must be utilized without regard to cost or degree of additional radwaste control achieved — would constitute an impermissible challenge to the existing regulations, at least in the absence of the showing required by 10 CFR 2.758.

During this interim period, although precise numerical standards are not available, significant assistance in interpreting the "as low as practicable" standard is furnished by 10 CFR 50.36a(b). One purpose of that provision is to permit a degree of flexibility with respect to levels of releases under unusual operating conditions, but the provision also reflects the Commission's view that average annual releases "at small percentages" of Part 20 limits are achievable under normal operating conditions. While this language does not embody a precise standard and does not serve to preclude consideration in an individual licensing proceeding of a contention which focuses on the qualitative factors now reflected in the definition of "as low as practicable," it nonetheless provides an important guideline to be utilized in evaluating the merits of such a contention. More specifically, we believe it embodies a Commission view that a radwaste system which can be shown to achieve "small percentages" of Part 20 limits is *prima facie* in compliance with the regulations. And, as is customary, the presentation of a *prima facie* case shifts the burden of going forward to the adversary, *i.e.*, to those asserting that the proposed system is inadequate.[16]

Our conclusion, just stated, concerning the effect to be attributed to the "small percentages" language stems from an application of the fundamental principle of statutory construction which requires that, if at all possible, a statute be interpreted in a manner which gives effect to all its provisions. *Weinberger* v. *Hynson, Westcott & Dunning,* 412 U.S. 609, 633 (1973). Under that principle, the "small percentages" language cannot be entirely ignored. Yet, by the same token, it cannot be equated with a fixed numerical standard which would effectively supersede the qualitative standards set forth in 10 CFR 20.1(c) and 50.34a(a).

[16] See and compare *Midland,* ALAB-123, *supra,* RAI-73-5 at 345.

In sum, in order to give effect to all portions of the applicable regulations, we must regard a showing by the applicant and staff that the proposed system will achieve "small percentages" of Part 20 limits as constituting *prima facie* support for the proposition that the "as low as practicable" criterion has been satisfied. Under this view, while the ultimate burden of persuasion on the issue remains with the applicant, the burden of going forward with evidence is shifted to the opposing party. In other words, the applicant can rest on a showing that "small percentages" will be achieved; to succeed, an intervenor must then adduce its own evidence — which, of course, can include cross-examination of the other parties' witnesses — to show that even lower emissions are "practicable."[17]

C. Against this background, we can agree with NECNP that the question of compliance with the "as low as practicable" standard, pending installation of the advanced offgas system, deserved closer analysis than it received in the Initial Decision. Moreover, in light of the applicant's own statements on the last day of the hearing (Tr. 6127-52), we are perplexed by the rejection of NECNP's proposed subsidiary finding 9(a), regarding the leaking fuel rods, as "not supported by evidence in the record" (Initial Decision, p. 46, RAI-73-2 at 143).[18]

We are not now required, however, to resolve the question of short-term compliance. We have been advised that the

[17] We stress again that adoption of numerical guidelines defining what is to be regarded as "as low as practicable" — such as is contemplated by proposed Appendix I — would alter this situation.

[18] In ALAB-138, *supra,* we held that NECNP had not timely sought to reopen the hearing on the hydriding question, and that that question was not of such overriding safety importance as to excuse the untimeliness. RAI-73-7 at 526. That holding on the question of reopening was not conclusive as to NECNP's exception to the Board's resolution of the question of interim compliance, for the exception would turn on an evaluation of the evidence put in the record before the hearing closed.

advanced off-gas system has been installed. The issue is, therefore, moot.[19]

D. Turning to the question of compliance with the "as low as practicable" criterion in the long term, we note that the Board's opinion does not specifically address that contested issue. The evidence did, however, reveal that liquid releases were to be kept to 1% or less of Part 20 limits (Technical Specifications, as amended, 3.8.B.2, 3.8.F.1.b; Tr. 1865-66) and that, after the installation of the advanced off-gas system, gaseous effluents would be kept to 2% or less of those limits (Tr. 4432, 4438-39).

In our view, these values are within the range of the "small percentages" of Part 20 limits contemplated by 10 CFR 50.36a(b).[20] The applicant having thus presented a *prima facie* case, the burden then shifted to NECNP to show that even lower levels were "practicable," all factors considered. NECNP began an inquiry apparently directed to that end, and succeeded in eliciting evidence to the effect that the applicant had not examined the feasibility of certain alternatives mentioned by NECNP's counsel (Tr. 1866-99, 1938, 1950-51). While this perhaps launched NECNP's inquiry in the proper direction, those concessions do not, standing alone, suffice to rebut the applicant's *prima facie* case. In our view, to succeed NECNP had to show not only that the applicant had not investigated certain hypothetical alternatives, but also that those alternatives were indeed "practicable" ones. There is no such showing in the record, and accordingly there is no basis for a holding that the applicant's proposed system, which limits releases to small percentages of Part 20 limits, can be improved upon in a "practicable" manner.

[19] The applicant installed the advanced system during an outage which occurred while we were concerned with those issues which, because of their significant safety implications, we had singled out for rapid disposition. See fn. 4, *supra*. In this regard, we should note that NECNP did not submit to us a request for a stay of the Initial Decision pending our consideration of the propriety of operations during the period prior to installation of the advanced system.

[20] In view of the mootness of the issue of interim compliance, we need not decide whether the expected short-term off-gas releases of 10% of Part 20 limits were within the "small percentages" range.

III

COOLING TOWER OPERATION

A. The flow of condenser cooling water for this facility can be regulated so that cooling is accomplished by one of three possible methods — once-through, or open cycle, cooling, in which the total flow is discharged directly to the river; closed cycle, in which the total flow passes through the cooling towers and is recirculated; and helper cycle, in which the amount of flow through the cooling towers and the amount of water recirculated can be varied. The applicant proposed to utilize the closed system at certain times, varying its operation according to the prevailing conditions. Without downgrading the need to prevent thermal pollution of the river, the intervenors pointed out that cooling tower operation itself could be environmentally degrading through creation of excessive fog or noise.

The Board found that little, if any, environmental insult would result from the operation of the towers. With respect to the noise problem, it found that "the surveys made of the noise levels indicate that they are acceptable." Initial Decision, p. 15, RAI-73-2 at 134. The Board then determined that, at least for an extended period, all operations must be under the closed cycle mode. Its reasons for doing so were as follows (Initial Decision, pp. 27-28, RAI-73-2 at 138):

> . . . the Board concludes that there are insufficient data respecting the existing ecosystem of the Connecticut River adjacent to the nuclear plant site to permit thermal or chemical releases into the river at this time, beyond the

minimal releases resultant from closed cycle operation, that more data from a more comprehensive effort than heretofore undertaken, should be developed so that the feed stock of the river can be determined, the effects of thermal and chemical releases can be analyzed, the species and number of fish affected can be approximated, seasonal effects determined, and other relevant matters developed. The Board determines that, as a suitable alternative that will not cause significantly adverse environmental impacts, Applicant should operate with closed cycle operations at all times until these data are developed and determinations made respecting significant adverse impacts on the environment by the advisory group for non-radiological environmental monitoring, which group is established in section 2.2.2 of the Technical Specifications. The Order of the Board for closed cycle operations herein will so provide, in order to protect the ecosystem before possible injurious effects have occurred and in order to reduce fish kill and damage to zooplankton and phytoplankton. . . .

Based on this statement, the Board imposed the following as Condition A to the license (Initial Decision, p. 53, RAI-73-2 at 146):

> Applicant shall operate the nuclear power facility with closed cycle operations at all times until data are developed and determinations made respecting significant adverse impacts on the environment by the advisory group for non-radiological environmental monitoring, which group is established by section 2.2.2 of the Technical Specifications dated September 9, 1972 as further modified by Staff change dated December 27, 1972.

The applicant did not take exception to the imposition of this condition and, under our rules, thus waived any objection. 10 CFR (1973 ed.) 2.762(a). NECNP, however, filed an exception to the Board's resolution of the noise issue, asserting that "it was error to conclude that the operation of the cooling towers at Vermont Yankee would create noise levels that would always be acceptable" (Exception No. 13). We viewed this exception as presenting at least an indirect

challenge to the Board's holding that, owing to environmental considerations other than noise, all operations must be in the closed cycle mode. At the same time, we were unsure of the precise meaning of Condition A. In terms, it required closed cycle operations until "data . . . respecting significant adverse impacts on the environment" were obtained. But, we thought, complete data of that nature could not be obtained without conducting at least some once-through operation and measuring its effects. And such operation appeared to be precluded by Condition A.

For these reasons, we raised *sua sponte* and directed the parties to discuss at oral argument the following question (ALAB-120, *supra,* RAI-73-4 at 268):

> Whether the Board's requirement . . . that the plant operate with cooling towers at all times until relevant data are collected:
>
> (a) will prevent the collection of data related to the effects of once-through operation; and
>
> (b) embodies the most appropriate alternative, from an environmental standpoint, for dissipating the waste heat generated by plant operation.

The first part of that question was, of course, suggested by the procedural dilemma we thought had been created by the wording of Condition A; the second part had been suggested primarily by the probability that, if NECNP's "noise" exception were well taken, the noise problem might outweigh the other environmental considerations relied upon by the Licensing Board.

B. We have concluded that no modification of the Board's resolution of the noise issue is warranted. We have also concluded that it is appropriate to clarify Condition A to reflect unambiguously what we, and all the parties, believe to be its intent. In light of these conclusions, and in the

absence of any exception directed to the substance of Condition A, no further examination of the matter of cooling tower operation is warranted.

1. We agree with the applicant that, contrary to the view expressed in NECNP's exception, the Board did not hold that noise levels "would always be acceptable." Rather, the Board held only that the information then available indicated that the noise levels were generally acceptable, but that continuing monitoring would be conducted and that, based on the results of that monitoring, modifications might later be deemed necessary. The Board's decision in this respect is a perfectly reasonable one in light of the evidence,[21] and we have found no basis for disturbing it. In this connection, we wish only to reemphasize that the staff should give careful consideration to the results of the monitoring, so that, if necessary, steps may be taken to reduce the impact of tower noise upon nearby residents and upon the educational process at the nearby school.

2. At the oral argument, each of the parties agreed that the principal concern which led the Board to impose Condition A was the absence of adequate base-line environmental data, and that the Board's intention was that once the base-line data were obtained, consideration could be given to conducting open-cycle or helper-cycle operations. In other words, the terminology employed in Condition A was intended to result first in the acquisition of adequate base-line environmental data; then the analysis of that data by the advisory group and a prediction of whether closed-cycle operation will result in "significant adverse impact on the

[21] See the affidavit of John T. Collins (ff. Tr. 5268) and the supplementary testimony of J. E. Kruek (ff. Tr. 5297). Although in some respects the sound levels in the school building with the windows open slightly exceeded recommended levels, in Mr. Collins' opinion this would not interfere with normal classroom discussion (Affidavit, par. 8.e. and 8.g.).

environment"; followed by, if justified, the grant to the applicant of temporary authorization to depart from closed cycle operations for testing purposes and, finally, permanent authorization to conduct other than closed cycle operations under particular conditions.

On that basis, the substance of Condition A is acceptable. Consequently, as each of the parties which addressed the issue agreed was appropriate,[22] we need only amend the language of that condition to reflect more accurately its substance (see p. 186, *infra*).

3. Our resolution of any doubts concerning the noise issue and our clarification of the meaning of Condition A removes the concerns that motivated us to raise the question of the appropriateness, from an environmental standpoint, of closed cycle operation. In other words, since we agree with the Board's discussion of the noise problem and share its view that additional base-line environmental data must be gathered, there is no basis for disturbing the requirement that only closed cycle operations would be permitted until the necessary base-line data were obtained.

IV

NRDC'S CLAIMS CONCERNING THE ADEQUACY OF THE ENVIRONMENTAL IMPACT STATEMENT

A. The basic claim made by NRDC, both in the proceedings before the Licensing Board and in the exceptions filed with us, is that the environmental impact statement, and in particular its cost-benefit analysis, does not comply with "the standards set forth by NEPA and the Commission" (Brief in Support of Exceptions, p. 1). The individual ex-

[22] See App. Board Tr., pp. 57-62, 70, 75, 189.

ceptions relating to this claim arose out of the following circumstances.

1. The final environmental statement (FES) prepared by the staff and issued in July 1972,[23] was introduced into evidence at the outset of the last, and largely environmental, session of the hearing. On the last day of that session, the staff presented for cross-examination Dr. Paul C. Fine, who had participated in the preparation of the FES (Tr. 6158-59). The parties cross-examined Dr. Fine extensively; in particular, NRDC — which had had no representative present on the earlier days of the final session — conducted lengthy cross-examination (Tr. 6223-99, 6309-11).

Perhaps the principal cost-benefit contention which NRDC advanced before the Licensing Board was that the FES did not sufficiently quantify or specify in monetary terms the costs and benefits associated with facility operation. NRDC's most serious concern in this respect was the failure to place a dollar value upon the benefit received by the public from the electricity to be produced by the facility.

The Board's decision on the question of the adequacy of the cost-benefit analysis was to "accept the several costs and benefits assessed by the Staff" with certain modifications (Initial Decision at 29, RAI-73-2 at 138). The principal modification stemmed from the Board's finding that, while the staff had for the most part "quantified all items in dollars to the extent possible . . . ," it had improperly failed to do so with respect to the electricity to be produced (Initial Decision at 31, RAI-73-2 at 139). In that connection, the Board held that the monetary value of the benefit of the

[23] The applicant had submitted an environmental report in August, 1970. That report was supplemented in December, 1971. The staff's draft environmental statement was issued for comment in April, 1972. The FES contains copies of the comments submitted in response to the draft statement, as well as the staff's response to those comments.

electricity could be determined by multiplying anticipated energy production in kilowatt hours by the average retail rate of 2.18 cents per KWH (Initial Decision at 32-34, RAI-73-2 at 139-40).[24]

2. NRDC's exceptions assert that, in a number of respects, the environmental impact statement, and particularly its cost-benefit analysis, is inadequate even as modified by the Board.[25] Many of the asserted defects are said to have been present in the staff's cost-benefit analysis and not corrected, or not susceptible to correction, by the Licensing Board. In spite of its insistence that the Board place a monetary value on the benefit accruing from the electricity produced, one group of NRDC's exceptions (numbers 13, 14, 15 and 22) objects to the Board's actions in that regard as being beyond the scope of the Board's authority, lacking in evidentiary support, and arbitrary in other respects.

The question as to whether, and if so how, the value of electricity should be calculated for consideration in an environmental impact statement is a significant and recurring one. As indicated above, NRDC urged that computation of a monetary value was required, but has excepted to the Board's performance of that task. We have reviewed the Board's treatment of the issue on a plenary basis, that is, not only in light of NRDC's specific complaints but also in the exercise of our broad authority to review from all stand-

[24] The Licensing Board did not undertake to perform that calculation itself, although under its view the result of the calculation would be a significant factor in the cost-benefit analysis.

[25] Commission regulations treat initial decisions by licensing boards, and appellate decisions issued by us or by the Commission, as *pro tanto* modifications of the FES. To the extent that they deal with environmental matters, such decisions stand as modified versions of the environmental impact statement required by NEPA and are transmitted to the Council on Environmental Quality; in addition, notification of their issuance is placed in the *Federal Register*. 10 CFR Part 50, Appendix D, Section A.11.

points the correctness of all aspects of an initial decision (see ALAB-124, *supra,* RAI-73-5 at 361).

B. We have concluded that the placing of a monetary value on the benefit of electricity is not mandated either by NEPA or by Commission regulations, and that attempting such a task serves no useful purpose. If anything, the appearance of precision resulting from such an exercise tends to divert scrutiny from the difficult judgmental decisions involved in performing an accurate cost-benefit analysis and, specifically, in determining whether a genuine need for the facility exists. Accordingly, we are vacating the modification concerning the dollar value of electricity made by the Board to the cost-benefit analysis.

1. We agree in full measure with NRDC's major premise that environmental impact statements should quantify costs and benefits to the fullest extent practicable, and do so in monetary terms. While the principal focus of judicial decisions has been on the quantification of environmental costs, we have no doubt that equal attention should be paid to the quantification of the benefits sought to be achieved by a proposed project.

The question remains, however, of the extent to which a meaningful dollar value can be placed on the benefits accruing from the licensing of electric generating facilities. Quantification is, of course, practicable in describing the amount and reliability of the electricity to be produced. Assigning a dollar value to represent the resulting benefit is, however, a different matter. It may be that, for some types of projects subject to NEPA, some of the benefits can be described meaningfully in monetary terms. But the benefits achieved from the generation of electricity cannot be so described.

To be sure, the formula adopted by the Licensing Board is attractive for its simplicity. Calculating the product of two factors — KWH × average retail rate — yields an apparently precise dollar value for the "benefits" of the project in terms of electricity produced. The attractiveness of this method is, however, only superficial. Closer analysis reveals its shortcomings.

In the first place, the record provides no basis — and we are aware of none — for an assumption that the value of having electricity available is no more than the retail price which a consumer of that electricity presently pays for it. The value to society derived from being able to meet a real demand for electricity is not measurable in dollars. If the electricity to be produced by a proposed project is genuinely needed — a point which we focus on later in this opinion and which deserves close scrutiny in hearings — then the societal benefits achieved by having that electricity available are immeasurable.

In other words, given the structure of our exising society, the alternative of not meeting real demand is unthinkable. Life as we know it — indeed, the present population itself — could not be supported without electricity. In that context, and to the extent that demand is inelastic, the value of electricity cannot be measured by the amount of the bill received by the consumer — it is, in a real sense, "priceless".

In short, the dollar value which the Licensing Board would place on the benefits of electricity is, in our judgment, not an accurate, or meaningful, one.[26] Nor is it particularly

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[26] Although, in its papers before us, the applicant appears to support the Licensing Board's approach (Brief in Opposition to Exceptions, pp. 50-53), its position before us may have been influenced by the fact that it was in the applicant's interest to defend the result reached by the Licensing Board. We find more convincing the applicant's insistence at oral argument before the Licensing Board that there exists no meaningful method

useful in attempting to construct a cost-benefit analysis. For example, the Licensing Board indicated that the average retail rate, which it utilized in calculating what it said were the "benefits", also reflected — by virtue of the nature of the rate-making process — the costs involved in producing those benefits (Initial Decision at 33-34, RAI-73-2 at 140). But NRDC, carrying this analysis to its logical — but admittedly absurd — conclusion, points out that under this approach the "benefits" of the proposed project are equivalent to the economic costs and thus economic and environmental costs together necessarily outweigh the "benefits" (Brief in Support of Exceptions, pp. 21-22). This points up the lack of meaning and utility in the Licensing Board's computation of a dollar value for benefits of electricity.

The same deficiencies can be seen from a slightly different viewpoint. The Board did note that some small portion of the retail rate — "perhaps .002 cents" — reflects profit or return on investment (Initial Decision at 34, RAI-73-2 at 140). Under this approach, "benefits" evaluated in terms of the retail rate would exceed the economic costs. But the amount of the excess of benefits over cost, supposedly a measure of the net "benefit" of the project, would in reality represent nothing other than the profitability of the utility's operation. As such, then, it is not a true measure of net "benefit", for surely there is little, if any, correlation between the profitability of the project to investors and the benefit of the project to society. Similarly, if a state elected to establish non-profit entities to produce electricity for its residents, it would not follow from the equivalency of re-

for placing a monetary value on the electricity to be produced (Oral Argument, Tr. 223-24). In that connection, we disagree with the inference drawn by the Board "that [the] Applicant contemplated that the value of electricity could be expressed . . ." in the manner the Board selected (Initial Decision at 32, RAI-73-2 at 139).

ceipts and costs that no net "benefit" accrued from the production of electricity.

2. No party has pointed to a suitable method for placing a dollar value on the benefits of electricity, and, in line with our discussion above, we believe none exists.[27] In the absence of such a method, the NEPA cost-benefit balancing must proceed along different lines.

In this connection, NRDC relies upon judicial decisions which, it asserts, establish a requirement that a cost-benefit analysis measure not just the costs and benefits of alternatives to the project, but the costs and benefits of the project itself.[28] But none of those decisions contained a full discussion of the application of that general principle concerning

[27] Throughout the Board's opinion and NRDC's brief, heavy reliance is placed, for the proposition, *inter alia*, that a monetary value must be placed upon electricity, upon the May 1972 "Guide for Submission of Information on Costs and Benefits of Environmentally Related Alternative Designs for Defined Classes of Completed and Partially Completed Nuclear Facilities". We note also that Regulatory Guide 4.2, entitled "Preparation of Environmental Reports for Nuclear Power Plants", issued in March 1973, states that the benefits of the electricity to be generated "should also be expressed in dollars by showing expected average annual revenues [with the] basis of assigning dollar values . . . clearly stated". § 8.1, p. 4.2-33.

In order to avoid any confusion on this score, we should observe that guides such as those referred to represent the thinking only of the regulatory staff, not the Commission itself. Indeed, an express disclaimer to that effect appears in Regulatory Guide 4.2, and the May 1972 Guide contains a statement (p. i) that it is "supplementary to the draft" which eventually led to the issuance of Regulatory Guide 4.2. In short, the documents are useful as guides; but they are not regulations and, insofar as the adjudicatory process is concerned, they represent only the opinions of one of the parties to that process and as such cannot be viewed as necessarily controlling. For its part, then, the Licensing Board attributed more significance to the statements in the Guide than was warranted. For our part, the portion of § 8.1 of Regulatory Guide 4.2 quoted above does not alter our conclusion concerning the inutility of attempting to assign a dollar value to the benefits of electricity.

[28] See *NRDC* v. *Morton*, 458 F.2d 827 (D.C. Cir. 1972); *Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F.2d 1109 (D.C. Cir. 1971); *EDF* v. *Corps of Engineers*, 470 F.2d 289 (8th Cir. 1972).

the implementation of NEPA to the licensing of electric generating facilities. It is appropriate, then, for us to set forth our own view as to the steps which should be followed in conducting a NEPA review of a proposed nuclear-powered electric generating facility.

At the outset, inquiry must be made into whether there exists a genuine need for the electricity to be produced. This inquiry involves not only an analysis of existing generating capacity and of projections of expected growth, but also consideration of the possibility that measures to curtail consumption will be initiated. In this regard, appropriate attention must be given to energy conservation considerations, insofar as they affect the likelihood that predicted demand will in fact ocur.[29] At the same time, however, cognizance can be taken of the effect which a shortage of fossil fuel, or a need to divert that fuel to other uses, might have upon demand for non-fossil fueled generating sources.

On the basis of this information, a preliminary decision can be made as to the extent to which some form of generating facility appears to be justified. Even a decision favorable to the applicant on this score does not, of course, mean that a proposed nuclear facility designed to meet the predicted demand will pass muster. The Commission must still examine the proposal in light of all of NEPA's purposes. At that stage, however, the focus shifts to the relative costs and benefits of alternatives to the proposed facility. Consideration of alternatives to the proposed project must be wide-ranging, embracing, *inter alia,* alternative

[29] The Commission has, in two recent decisions, emphasized that full consideration must be given to appropriately framed energy conservation contentions. *Niagara Mohawk Power Corp.* (Nine Mile Point Unit 2), RAI-73-11 995; and *Consumers Power Co.* (Midland Units 1 and 2), RAI-74-1 19.

generating methods, alternative sites,[30] and alternative auxiliary equipment (*e.g.,* cooling towers). Consideration of these subjects requires a comparison of the relative benefits achieved and costs incurred under each of the alternative proposals, so that the optimum alternative may be selected.

Finally, an overall balancing of costs and benefits occurs, but it is not necessary for this purpose to attempt to place a dollar value on the benefits of the electricity to be produced. Instead, on a qualitative basis, the costs associated with the optimum alternative selected must be balanced against the benefit achieved by meeting the degree of demand anticipated. To be sure, if the facility will satisfy a real demand for electricity that cannot be met by the purchase of power from other systems, then the result of the balancing may be a foregone conclusion in that, as indicated above, the alternative of not meeting the demand is unthinkable.

For the reasons stated, we are compelled to vacate that portion of the initial decision requiring the assignment of a dollar value to the benefits of electricity. Having done that, NRDC's exceptions to the precise manner in which the dollar value was to be assigned (see p. 172, *supra*) are no longer of consequence. Moreover, NRDC's broad objection to the effect that no overall balancing was undertaken (exception 2) must be rejected, since what NRDC views as a "pretense at balancing" (Brief, p. 10) comports with our broad outline of the steps to be followed in fulfilling the purposes of NEPA.

[30] See, *e.g.,* the October 5, 1973 letter from the Director of Regulation to the applicant in Docket Nos. 50-354 and 50-355, *Public Service Electric & Gas* (Newbold Island), stating that "an important requirement in the preparation of an environmental impact statement for a nuclear power plant is, of course, a consideration of alternative sites" and concluding that an alternative location was "a more desirable alternative from an environmental standpoint."

C. The preceding discussion of those of NRDC's exceptions relating to the monetary value of the benefits of electricity touched, in the broadest terms, on the general content of environmental impact statements. In this section, we consider NRDC's remaining exceptions, which assert that there were a number of defects in the environmental impact statement for this particular facility.

1. NRDC's claim that the cost-benefit analysis was "unsystematic and lacked rigor" (exception 1; Brief, p. 7) rests on two narrow assertions: (1) while costs and benefits should have been kept separate, there were "two examples where alleged benefits appeared in the cost section", and (2) "the text of the cost section on the proposed action is randomly interspersed with some but not all of the costs and benefits of some of the alternatives" (Brief, p. 7).

We agree in principle with NRDC's contention that a systematic approach must be brought to bear on the complex questions and decisions involved in conducting and describing a cost-benefit analysis related to a proposed nuclear facility. But examination of the portions of the record referred to by NRDC reveals that the deficiencies allegedly present here are of a minor nature. They stem, not from inadequacies in conducting the cost-benefit analysis, but rather only from the selection of an inartful method of describing some of the relatively insignificant results of that analysis. Contrary to NRDC's claim that their effect has been the "shielding [of] the decision-making process behind a smoke-screen of confusion" (Brief, p. 9), these deficiencies do not prevent the reader of the FES either from gaining a clear understanding of what is involved or from framing a challenge to the facts contained or conclusions expressed therein. Thus, while this exception has some validity in principle, no substantive modifications of the envrionmental statements are called for.

2. By another group of exceptions (numbers 3, 4, 5, 6(ii)-6(v), and 21), NRDC argues that the magnitude of the costs of the project were not disclosed by the environmental impact statement. Specifically, claims NRDC, certain costs were either omitted entirely, not identified with particularity, or not monetarily quantified to a sufficient degree.

NRDC's principal argument in this respect concerned the cost of the fuel cycle, which we have already discussed in connection with NECNP's exceptions *(supra,* pp. 163-164). It also placed heavy emphasis, however, on the allegedly inadequate consideration given to the several types of emissions from the plant, and suggested that a dollar value could readily have been assigned to the adverse environmental impacts of those emissions by considering their effect upon real estate values.

Unlike the claim that the benefits from electricity produced can be represented by a dollar value, NRDC's suggestion concerning consideration of changes in real estate values as a measure of costs holds out some promise. If plant emissions do have an effect on real estate values, measuring that effect would provide a useful, meaningful method for evaluating some of the costs associated with facility operation. But the only evidence in the record on this point was provided by a staff witness whose statements, on cross-examination, appear to indicate that he did not know how the effect, if any, of emissions on real estate values could be measured in the circumstances presented here (Tr. 6174, 6200, 6281, 6286-87). In the face of that testimony, it was incumbent upon NRDC to adduce evidence of its own to demonstrate that its suggestion was, indeed, a workable one. In the absence of such a demonstration, we must proceed on the basis of the uncontradicted testimony rejecting real estate evaluation as a useful tool in this case. The exceptions are denied.

3. A third group of exceptions (numbers 7, 8, 9, 10, 16, 17 and 18) reflects NRDC's view that confusion existed with respect to the "issues concerning secondary benefits" (Brief, p. 16). The short answer to these exceptions is that, as a staff witness pointed out, the secondary benefits listed in the FES *(e.g.,* local taxes and local employment) were mentioned only for informational purposes and did not play a part in the decision to proceed with the proposed project (FES, p. XI-14, par. B.8; Tr. 6175, 6198-99, 6290-91). Because many of the "secondary benefits" consist of transfer payments resulting in offsetting costs and benefits, we agree with the staff and NRDC that they have no place in the overall evaluation of the appropriateness of the project.[31]

4. As we discussed in connection with the reasons why the assignment of a monetary value to the benefits of the electricity to be produced is unnecessary, an environmental impact statement must contain a thorough analysis of alternatives. NRDC asserts that the cost-benefit analysis for this project reflects an inadequate treatment of alternatives (exception 23; Brief, p. 22). Its sole argument in support of this assertion runs along the following lines: (1) the alternative most fully considered in the FES was closed cycle cooling; (2) the Board found this alternative to be inadequately treated, and (3) "it follows" that the staff's less thorough discussion of other alternatives is also below the requisite standards.

The difficulty with this argument is that the Board rejected the staff's conclusion with respect to the closed cycle cooling alternative not because the staff's discussion was inadequate, but because the Board disagreed, *on the merits,*

[31] The Licensing Board modified the FES by "classifying local taxes as a benefit, rather than as a cost which the Staff considered [them to be]" (Initial Decision at 38, RAI-73-2 at 141). Our reading of the FES and the relevant testimony does not, however, reveal that the staff treated local taxes as a cost. In any event, in light of our discussion in the text, above, this "modification" embodies no error warranting corrective action.

with the staff's conclusions. Stated otherwise, the Board believed, based on its evaluation of the facts, that a different alternative than the one selected by the staff should be adopted. From this, it does not "follow" that the conclusions reached by the staff with respect to possible alternatives in other areas should also be rejected, even if the discussion of those alternatives was abbreviated. The question is whether, on the merits, different conclusions with respect to those alternatives should be drawn. Except with respect to the early installation of the off-gas system (discussed in Part II of this opinion, *supra*), NRDC has pointed to no specific deficiencies in the discussion of alternatives, and no evidence indicating that an improper evaluation of alternatives was made. No further inquiry into the question of alternatives is warranted.[32]

5. The final point deserving discussion is NRDC's claim that the staff offered no expert testimony on cost-benefit analysis. This claim is based on NRDC's view that the staff witness, Dr. Paul Fine, was not an expert (Exception 12; Brief, pp. 19-20).

This argument suffers from a number of procedural and substantive defects. In the first place, no objection to Dr.

[32] In addition to its general exception on the question of alternatives, NRDC did file an exception (number 26) directed to the assertedly inadequate discussion of alternative means of decommissioning the facility. But any additional discussion of alternative methods of decommissioning would have been an idle exercise. Decommissioning will not take place for some forty years and, in our judgment, nothing would be less profitable than attempting to evaluate now what method of decommissioning will be deemed most desirable forty years from now, in light of the knowledge which will have been accumulated by that time. And, while NRDC in its Brief (p. 33) calls for an examination of "means of lessening the impact of decommissioning," we are not aware of any measures, and NRDC has pointed to none, that could have been taken in the latter stages of construction that would have lessened the impact of whatever form decommissioning eventually takes. NRDC presented nothing to indicate that the nature of the inquiry it is calling for would be other than entirely speculative and hypothetical. In that circumstance, there was no basis for undertaking such an inquiry.

Fine's qualifications to offer expert testimony was made either when he first appeared or after he concluded his testimony. Indeed, it was not until briefs were filed some forty days later that the question was first raised. Permitting such a late challenge to the qualifications of an expert would be seriously prejudicial to the rights of the party on whose behalf the expert appears and to the orderly conduct of hearings. In administrative hearings and judicial trials, if one "expert" put forth by a party is rejected as not qualified on the basis of a timely challenge, that party may wish to attempt to qualify a different witness to testify as an expert on its behalf. If a meritorious challenge to the qualifications of a witness is permitted to be withheld until after the taking of evidence is concluded, then one of two undesirable results would follow: either (1) the party sponsoring the witness would be deprived of its opportunity to present a different expert; or (2) the hearing or trial would have to be reopened to afford the sponsoring party that opportunity. Neither result would be tolerable. In the absence of a justification for the delay in bringing the challenge, NRDC's challenge must be rejected as untimely.[33] Specifically, to the extent that the claim of inexpertise goes to Dr. Fine's background, training and experience, that claim should have been raised on voir dire. And to the extent that the claim is founded on testimony given by Dr. Fine which, according to NRDC, documented his lack of expertise, that point should have been raised as the testimony unfolded or at the

[33] See McCormick on Evidence, § 70, pp. 149-50: ". . . when the witness is first called to the stand to testify, the opponent must then challenge his competency, if grounds of challenge are then known to him. If not then known, and the cause for disqualification is disclosed in the testimony the challenge may then be made." [footnotes omitted]

time it was concluded, rather than forty days after the hearing closed."[34]

In any event, we think NRDC has failed to establish a lack of expertise on Dr. Fine's part. To the contrary, NRDC itself draws heavily on the opinions expressed by Dr. Fine as support for many of the positions taken in the brief filed in support of its exceptions (see, *e.g.*, Brief, pp. 4-7, 9, 12, 15, 17). And examination of the portions of the transcript which NRDC relies upon as demonstrating Dr. Fine's "confusion" reveals, at most, that Dr. Fine held and expressed opinions at variance from those held by NRDC's counsel. This provides no basis for a determination by us that Dr. Fine lacked the requisite expertise. If it disagreed with his views, the burden was on NRDC to adduce evidence, through experts of its own or some other means,

[34] At oral argument before us, NRDC referred to the procedure utilized in connection with the admission of the FSAR into evidence as justifying the failure to challenge Dr. Fine's entitlement to expert status in a timely manner (Appeal Board Tr. 101-02), 216-17). Having examined the procedure referred to, we have concluded that the Licensing Board's sanctioning of it in no way furnished justification for the course followed by NRDC with respect to Dr. Fine's testimony.

When the FSAR was offered into evidence, some doubt arose as to whether its initial admission into evidence would be viewed as an expression of approval of its contents, and, concomitantly, whether a refusal to object to its admission would constitute waiver of the right to challenge the validity of its contents (see Tr. 585-610). Thus, the Board had to face the question as to whether (1) to admit the FSAR, subject to cross-examination of the sponsoring witnesses and, possibly, a subsequent motion to strike all or part of it, or (2) to withhold ruling on its actual admission pending inquiry into the validity of its contents. As was well within its discretion, the Board determined to follow the former procedure (Tr. 610). A similar procedure appears to have been followed with respect to the admission of the FES (see Tr. 5238-60). But this meant only that, after the FES was admitted, NRDC retained the right to attack its contents through the introduction of further evidence. By thus permitting challenges to the contents of documents to be deferred, the Board in no way relieved NRDC of the obligation to raise in a timely manner objections which it may have had to the qualifications of subsequent witnesses.

tending to show that Dr. Fine's expressed opinions were of such a nature that they called his expertise into question.[35]

V

MISCELLANEOUS ISSUES

A. *Energy Conservation Alternatives.* In its proposed conclusions of law, NECNP pointed to the failure of the Final Environmental Statement to consider, as an alternative to full power operation of this facility, the use of energy conservation measures. In particular, NECNP claimed, the FES did not discuss the elimination of promotional advertising and the redesign of the electric rate structure (Proposed Conclusion 1(b)). The Board rejected the proposed conclusion, without specific discussion (Initial Decision at 47, RAI-73-2 at 144). NECNP's exception 5 asserts that insufficient attention was given to energy conservation. As indicated by our earlier comments (p. 175, *supra),* the general principle advocated by NECNP is a sound one. As previously noted, the Commission has made it plain that energy conservation contentions have a legitimate place in licensing proceedings (see fn. 29, *supra).*[36]

At the time the National Environmental Policy Act was passed, however, this facility had been under construction for two years. At the time the FES was written, the facility was nearly ready for operation. Whatever impact the evaluation of energy conservation measures might have had at the time construction permits were under consideration will be considerably lessened, if not eliminated entirely, at

[35] In light of our denial of NRDC's other exceptions dealing with the environmental impact statement, we deny exception 11, which was not separately briefed and which only summarizes points NRDC made elsewhere.

[36] The Federal Power Commission had adopted a similar policy. See its "Guidelines for Preparation of Applicants' Environmental Reports," par. 8.2 (38 *F.R.* 15944, 15949, 15952, June 19, 1973).

the operating license stage. NECNP itself appears to recognize this, for its energy conservation argument seems to seek, not a ban on facility operations entirely, but only the imposition of limitations on operation during periods when such operation would allegedly be harmful from a radiological or environmental standpoint (Brief, pp. 8-9). As illustrative examples, it suggests *(ibid.)* that utilization of energy conservation measures might permit the imposition of (1) restrictions on operations at times when operational noise is affecting the educational process at a nearby school, or (2) a ban on operations pending the installation of the improved gaseous radwaste system (see Part II, *supra).*

Under the circumstances presented here, there was no occasion for a discussion in the FES of the particular suggestions NECNP now advances as a means of reducing demand. NECNP's comments on the draft environmental statement did not mention these ideas except by way of the very general criticism that "ways of reducing demand are not analyzed" (FES, A-144). Moreover, although not precluded from doing so, NECNP put in no evidence of its own to demonstrate that adoption of such measures would indeed allow more flexibility to impose restrictions on operations at appropriate times. Consequently, the Board would not be expected to impose such restrictions. Finally, the latter of the two suggestions made by NECNP has been mooted (see p. 167, *supra*), while the noise problem referred to in the former will be given full consideration in any event (see pp. 169-170, *supra*).

B. *Allegedly Unsupported Factual Findings.* Several of NECNP's exceptions (numbers 12, 14 and 15) reflect claims that certain factual findings made by the Licensing Board are unsupported by the record. From the manner of presentation of the argument in support of those exceptions (Brief, p. 23 and par. 1 and 3 on p. 24), we gather that those

exceptions relate to factual findings which are not viewed as crucial to the ultimate result reached in the case. We discuss those exceptions briefly.[37]

1. In discussing the environmental impact of the cooling towers, the Licensing Board mentioned its concern with "the inclusion of chemicals associated with river water, such as cadmium [and] mercury . . . , that may be carried off site" (Initial Decision at 16, RAI-73-2 at 134-35). This concern was alleviated, however, by the evidence that there was "no drift of water droplets off site and thus no transport of chemically laden particles" in tests made at 50% of full power (Initial Decision at 16, RAI-73-2 at 135).

In discussing its concern over possible effects from these chemicals, the Board found that "there is no evidence of significant concentrations of those chemicals in the river water" *(ibid.)*. Citing comments filed by the Environmental Protection Agency in response to the draft environmental statement, NECNP excepts to this finding.

EPA's letter did state that "there exist unusually high levels of cadmium and mercury in the Connecticut River" (FES, p. A-75).[38] Thus, NECNP's exception is well taken, at least to the extent that the EPA letter — which was admitted into evidence as part of the FES — establishes the literal incorrectness of the finding that there was "no" evidence of significant concentrations of the two metals. There

[37] NRDC's exception 19 deals with a statement the Board made with respect to its acceptance of the applicant's proposed findings. That exception is denied as lacking in either materiality or specificity, depending upon its purpose.

[38] EPA's concern was not with off-site drift as such. Rather, EPA feared that, as a result of evaporative losses occasioned by cooling tower operation, the concentration of these metals would increase, that is, that there would be even higher concentrations in the cooling tower blowdown than were present in the original river water. This, in turn, could lead to a higher accumulation of these metals in the tissue of fish and other aquatic biota. See FES, pp. A-75–A-76.

was, however, evidence adduced which countered EPA's unparticularized assertion and demonstrated, based on actual monitoring, that the levels of these metals in the Connecticut River are quite low. See FES, p. II-18; Ex. 1 to written Testimony of George Starbuck, following Tr. 5229. That evidence is far more persuasive than EPA's unsupported conclusory assertion.[39]

In any event, NECNP does not urge that we add any conditions to the license to insure that no injury results from the presence of these metals in the cooling tower blowdown. In light of the applicant's commitment to monitor and, if necessary, treat that blowdown, we find it unnecessary to take further action.

2. The temporary operating license issued on September 7, 1972, did not expire until February 28, 1973. Because the hearing was closed on November 9, 1972, NECNP takes exception to the Board's statement in its initial decision, issued virtually contemporaneously with the expiration of the temporary operating license, that there "has not been any injury" to the public in the course of "the operations undertaken pursuant to the temporary operating license" (Initial Decision at 4-5, RAI-73-2 at 131).

It is not clear to us that the Board's statement was intended to cover the period after the hearing closed. If it was, we would agree with NECNP that it was overbroad and unsupported by the record. In addition, it would have

[39] While the evidence referred to rebuts EPA's assertion, the discussion in the FES of EPA's comment was non-responsive. FES, pp. XII-1–XII-2. Thus, that portion of the FES does not discuss the Connecticut River but instead states only that "the concentrations of cadmium and mercury *in waters of rivers in the U.S.* are extremely low" [emphasis added]; even then, it goes on to concede that very low concentrations of mercury and cadmium in water "can produce toxic effects on aquatic organisms," and thus does little to alleviate the concerns expressed by EPA (see fn. 38, *supra*).

been gratuitous for, as NECNP points out (Brief, p. 23), "there was no attempt to explore this issue" in the hearing. For precisely these reasons, we have not given any weight to this statement of the Board in reaching our decision. Any error that might have been committed is, therefore, harmless.

3. NECNP asserts that there was no record basis for the Board's finding that "the present shutdown", which took place after the record was closed, "was undertaken out of an abundance of caution on an emergency basis to examine and determine the extent of the effect" from fuel rod hydriding (Initial Decision at 11, RAI-73-2 at 133). Again, NECNP's exception is technically well-taken. But the exception ignores that NECNP itself had urged at oral argument before the Licensing Board that the shutdown constituted the "first refueling outage" at which the applicant was committed to install the advanced off-gas system (Oral Argument Tr. 163). We view the Board's finding as nothing more than a response to that argument, premised on an analysis of the situation as counsel had represented it to exist. In any event, the point is now moot (see p. 167, *supra*).

C. *Continued Service of Documents.* The Licensing Board refused NECNP's request that it require the continuation, during the full term of the license, of the practice, followed during the hearing, of serving all applicant-staff correspondence relating to the facility upon the parties and the Brattleboro public document room. NECNP's challenge to that ruling (exception 16) is met by the applicant's argument (apparently endorsed by the staff) that no rule or regulation requires such service to be continued.

We believe that the questions of continued service upon the parties and continued maintenance of the document room are governed by different considerations. The parties' entitlement to personal service derives from their participation in an ongoing administrative proceeding. That right is different in nature from the right, if any, of the public generally to access to relevant documents in the vicinity of the plant.

With respect to service upon the parties, our decision is controlled by our view that a contested licensing proceeding cannot be said to be fully completed until judicial review has been concluded (or the time for seeking such review expires without review having been sought). Moreover, during the course of judicial review, the parties have the right to request the court to remand the case to the Commission for the consideration of new evidence. 28 U.S.C. 2347(c). Although such a request may well be less freely granted than a request to reopen a hearing prior to issuance of an initial decision (see ALAB-138, *supra,* RAI-73-7 at 523), the two rights are analogous insofar as their effective exercise, in circumstances where time is of the essence, requires ready and rapid access to new information. For these reasons, we hold that the practices with respect to service of documents upon parties followed during the course of the administrative proceedings must continue unabated during the period allowed for seeking judicial review; thereafter, during the pendency of judicial review, those practices must continue unabated with respect to those parties who participate in the judicial review proceedings.[40]

While the service of documents upon the parties must, therefore, be continued for a time, we have concluded that

[40] Nothing we say here, of course, is intended to preclude some or all of the parties from entering into voluntary arrangements to continue serving documents after judicial review has been concluded. And, the issue not having been presented here, we express no opinion as to whether a party is entitled, after judicial review has been concluded, to personal service of those documents which relate to a continuing reporting or monitoring requirement imposed in connection with the resolution of an issue as to which the party had played an active role in the hearing.

there need not be continued maintenance of a document room in the locality of the plant. No statutory or regulatory provision expressly requires the maintenance of such a room; indeed, since the Commission has by regulation provided for a general public document room in Washington, D. C. (10 CFR 2.790, 9.7),[41] it is fair to draw the negative inference that the Commission presently intends that no other document room need be maintained.

NECNP argues, however, that the existence of a local document room is necessary to preserve and make effective the public's right "to utilize the procedures for suspension or revocation of a license under 10 CFR Part 2, Subpart B" (Brief, p. 25). This argument has some force. Thus, although it is unstated in the regulations, the practice in recent times has been to afford the public a right to utilize those procedures by requesting the Commission or the Director of Regulation to initiate proceedings, by the issuance of a "show cause" order, to modify, suspend or revoke a license. 10 CFR 2.202.

We can also agree with NECNP's theory that statutes or regulations conferring substantive rights can be read as conferring also those procedural rights necessary to an exercise of the substantive right. See, *e.g.*, *Steele* v. *Louisville & Nashville RR Co.*, 323 U.S. 192, 204 (1944). Where we part company with NECNP is on the proposition that the existence of a local public document room is a procedural right necessary to the exercise of the right to call for the initiation of a "show cause" proceeding. There are alternative methods by which the public can obtain information. These methods include the use of the Washington, D. C. Public Document Room and the exercise of the rights conferred by the Freedom of Information Act. See 10 CFR

[41] Document rooms serving limited purposes are maintained at certain major operating field offices. 10 CFR 9.7, 1.3(b).

9.8. In the absence of the time constraints which exist during the course of the basic licensing proceeding, these alternative methods are adequate to permit effectuation of the right to call for a "show cause" proceeding.

In short, there is no "necessity," in the legal sense, for the continued maintenance of a local document room.[42] But there certainly is a substantial degree of administrative burden attached to maintaining such a room. In this connection, the requirement NECNP would have us impose would be applicable to all reactor facilities, since NECNP's argument does not rely upon any special circumstances associated with this facility. For these reasons, and because the Commission has provided by rule for the Washington, D. C. document room, we believe that the question as to whether local document rooms should be maintained during the life of a facility license is one that can be addressed only by the Commission in the exercise of its rulemaking authority and not by this Board in the exercise of its adjudicatory functions.

D. *An "Unresolved" Matter.* In a footnote to its opinion, the Licensing Board observed that during the proceeding below it had raised a question concerning the staff's recommendation that during operations the containment atmosphere be inerted by the use of nitrogen (Init. Dec. p. 12, fn. 3, RAI-73-2 at 133). As the Board related it, the applicant had objected to this recommendation but had not called for resolution of the dispute in the hearing. According to the Board, the staff had failed to furnish data which the Board

[42] In our opinion, no such necessity may be inferred from the fact that a local public document room is maintained during the course of a proceeding. Even if — and we do not intend to intimate a view on this question — such a room were deemed "necessary" to the effective exercise of certain rights at the hearing stage (*e.g.*, the right to petition for leave to intervene in the hearing), that would not be determinative as to whether it is necessary to the exercise of rights existing at a later stage.

had requested on this point. Having said that, the Board terminated its discussion by noting that the question remained "unresolved" *(ibid.)*.

We have been supplied with no record references which would have enabled us to ascertain the precise nature of the Board's expressed concern. We note, however, the concern of the Advisory Committee on Reactor Safeguards (ACRS) that a consequence of inerting may be to make more difficult "inspection and repair of the primary system".[43] As we understand it, inerting has the intended purpose of mitigating the potential consequences of a very unlikely accident. In achieving that purpose, it can have the adverse consequences of hampering thorough inspection and repair activities (thereby threatening to increase the possibility of the accident whose consequences are intended to be mitigated) and posing a health and safety threat to one segment of the public, *i.e.*, plant workers.[44]

The question raised by the Board should not have remained unresolved. As we noted in an earlier opinion, this operating licensing proceeding is governed by the former version of the Rules of Practice, whereby issues other than those raised by the parties may be considered by the adjudicatory tribunals (ALAB-124, *supra,* RAI-73-5 at 362, fn. 4). The issue raised by the Board is a significant one which has been the subject of discussion for some time.

In view of the lengthy period during which this proceeding has been before us, we are reluctant to defer any longer our complete resolution of all the issues presented. Yet the issue of the advisability of inerting is not susceptible of resolution on the existing record (which to our knowledge

[43] See p. 3 of the March 9, 1971 ACRS "Report on Vermont Yankee Nuclear Power Station."

[44] See, in the latter respect, *Iowa Electric Light and Power Co.* (Duane Arnold Energy Center), ALAB-134, RAI-73-7 483.

is silent on this issue) and we believe that to leave the issue unresolved would constitute an abdication of our responsibilities. For these reasons, we are directing that the following memoranda be submitted to us:

(A). If the applicant and staff have reached a mutually satisfactory resolution of this issue, a memorandum from the staff by Friday, March 8, 1974 (with replies, if any, from other parties by Wednesday, March 20, 1974), delineating (1) the substance of the solution; (2) the basis for the belief that the safety questions raised by the Licensing Board and the ACRS have been satisfactorily resolved; and (3) a suggested approach for submitting the matter to this Board for resolution on the record.

(B). If the applicant and staff have not reached a mutually satisfactory resolution of this issue, a memorandum from each of these parties by Friday, March 8, 1974 (with replies from them and any other interested parties by Wednesday, March 20, 1974) delineating (1) the substance of each party's position on the issue; (2) the basis for the belief by each that adoption of its position would constitute a satisfactory resolution of the safety questions presented; and (3) a suggested approach for resolving the issue on the record.

VI

CONCLUSION

For the reasons stated, the exceptions are *denied* except insofar as granted in part herein.[45] The parties shall continue to serve documents in accordance with the requirements set forth herein. Condition A to the license is to be rewritten to read as follows:

Applicant shall operate the facility only under the closed cycle mode of cooling until, in the opinion of the advisory group for non-radiological monitoring (estab-

[45] Even though certain exceptions have been granted in part, the effect of that action has not been to disturb the existing operating license authorization.

lished by Section 2.2.2 of the Technical Specifications, as amended), (1) sufficient data have been obtained to establish an environmental base-line so that changes produced by other modes of cooling can be properly evaluated, and (2) in light of such data, there is reasonable assurance that testing of other cooling methods will not itself result in significant adverse effects on the environment. Thereafter, with the approval of the AEC Regulatory Staff, operations utilizing other modes of cooling for testing purposes may be undertaken. Upon completion of the tests, the advisory group shall make recommendations to the staff concerning the permanent restrictions, if any, which should be placed upon operations under other than the closed cycle mode of cooling.

In accordance with our established practice, we have examined those portions of the initial decision to which no exceptions were taken. With the possible exception of the question of inerting, our examination does not disclose any error on the Board's part which would affect the validity of its conclusion that the authorization of the issuance of an operating license was merited by the evidence.

Accordingly, subject to the outcome of the presently-unresolved question of inerting, and except insofar as modified herein, the initial decision is *affirmed*.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

MARGARET E. DUFLO
Secretary to the Appeal Panel

ATOMIC ENERGY COMMISSION REPORTS

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ATOMIC ENERGY COMMISSION
WITH SELECTED ORDERS

July 1, 1972, to December 31, 1972

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD:

Sidney G. Kingsley, *Chairman*
Dr. John H. Buck
Dr. Lawrence R. Quarles

Docket Nos. 50-329, 50-330

In the Matter of

CONSUMERS POWER COMPANY
(Midland Plant, Units 1 and 2)

Memorandum and Order

(ALAB-60)

This is a proceeding on an application for construction permits for two pressurized water nuclear power reactors,

each with an initial power rating of 2452 thermal megawatts, to be located on the shore of the Tittabawasse River adjacent to the city limits of Midland, Michigan. An atomic safety and licensing board presiding over the hearing has referred to us, pursuant to 10 CFR 2.730(f), its order of March 10, 1972 concerning the extent to which all aspects of the fuel cycle "from the mining of uranium to the ultimate storage of high level wastes" are to be considered in this proceeding. The referral raises the question of the scope of the Commission's duties in conducting the environmental study required by Section 102(2)(C) of the National Environmental Policy Act, 42 U.S.C. 4332(2)(C).

The order of the Atomic Safety and Licensing Board is that the environmental effects of the mining, production and fabrication of nuclear fuel and the handling of spent fuel, including its chemical reprocessing and waste storage, are at issue in this proceeding only with respect to:

1. Transportation of fuel elements from a fuel fabrication plant to the reactor site;

2. Transportation of spent fuel elements from the reactor site to a fuel reprocessing plant;

3. Transportation of packaged radioactive material from the site to low level waste burial grounds; and

4. Radioactive discharges at the site and any other environmental effects directly associated with the handling and use of fuel at the site.

The Board's referral arises primarily from the contentions of several groups of intervenors. The State of Kansas is particularly concerned with the possibility that certain wastes from nuclear power reactors in general might be stored in the State of Kansas, but it has associated itself generally with the objections of the intervenors.[1] The

[1] The possibility of underground storage of nuclear wastes in abandoned salt mines in Kansas has been considered by the Commission, but other alternatives are now being explored. See H. Rept. No. 92-1066, 92d Cong. 2d. Sess. 11-12.

Board's referral is phrased in terms of the entire fuel cycle, as are the intervenors' contentions. The basic position of the intervenors is substantially similar to that of the intervenors in *Matter of Vermont Yankee Nuclear Power Corporation* (Docket No. 50-271), which was the subject of our memorandum and order of June 6, 1972,—AEC—.

The Commission's regulatory staff has filed a voluminous final detailed statement on environmental considerations after receipt of comments from the public, the Council on Environmental Quality, and other Government agencies as required by the Commission's regulations, 10 CFR Part 50, Appendix D.[2]

The Licensing Board has recommended that, under the authority of 10 CFR 2.785(d), we refer its rulings to the Commission as raising novel questions of law and policy. We decline to do so on the grounds on which we rested such a decision in *Matter of Vermont Yankee Nuclear Power Corporation*,—AEC—(June 6, 1972), and on the additional ground that, as to portions of the fuel cycle concerned with the reprocessing of irradiated nuclear fuel and the disposal of wastes after irradiation of fuel in a reactor, the Commission has permitted that decision to stand. See 10 CFR 2.786.

On the basis of our decision in *Vermont Yankee* and for the reasons expressed there, we hold that the order of the Licensing Board is affirmed as to the environmental effects of the handling of spent fuel, including chemical reprocess-

[2] 36 F.R. 18071, September 9, 1971. See also 36 F.R. 18716, September 21, 1971; 36 F.R. 19153, September 30, 1971; 36 F.R. 21579, November 11, 1971; 36 F.R. 23900, December 16, 1971; 37 F.R. 864, January 20, 1972; 37 F.R. 9619, May 13, 1972; 37 F.R. 9779, May 17, 1972.

ing and waste storage. And we now extend that interpretation of the National Environmental Policy Act to earlier stages of the fuel cycle.

The issue as to the part of the fuel cycle before the irradiation of fuel in a reactor raises the question which we considered in *Vermont Yankee;* the definition, for the purposes of the Environmental Policy Act, of the "project" or "action" of the agency under Section 102 of the Act, 42 U.S.C. 4332, and the Commission's regulations, 10 CFR 50, Appendix D. Again the question is identification of the "major Federal action significantly affecting the quality of the human environment" (National Environmental Policy Act, Section 102(2)(C), 42 U.S.C. 4332(2)(C) which this agency is now undertaking. What this agency is undertaking is consideration of the issuance of permits to construct two individual power reactors.

The fuel to be used in these reactors will be of a common type: an array of fuel rods each of which consists of uranium dioxide sealed in cylindrical zirconium alloy containers. The uranium is mined as ore which is later pulverized at uranium mills. It is then dissolved by chemical means at processing plants, and the dissolved uranium is recovered and calcined to yield uranium oxide powder. This powder is refined at various plants to yield essentially pure uranium oxide. By successive chemical processes, the oxide is converted to crystalline uranium fluoride. The fluoride is converted to a gas, uranium hexafluoride. The gas is enriched at gaseous diffusion plants; the diffusion process separates it into a product having a concentration of the isotope uranium-235 higher than in normal uranium, and a depleted fraction having a uranium concentration lower than normal.

The enriched uranium is converted by chemical processes to uranium dioxide (or some other solid compound), is prepared in an appropriate physical form, and is then clad in

zirconium alloy (or stainless steel) to produce fuel elements. After irradiation in a reactor, the fuel is reprocessed in a reprocessing plant by chemical solution of the fuel elements and the separation of useful uranium and plutonium for recycling for future use. Under current practice these successive processes of mining, milling, refining, enrichment, conversion, fabrication, irradiation, and reprocessing constitute the fuel cycle.[3]

There are over 200 uranium mines in this country alone, some underground and some of the open pit type, as well as other sources of uranium.[4] Twenty mills are in operation or scheduled to go into operation during the current calendar year; four plants are engaged in the conversion of feed materials to uranium hexafluoride, and there are competing foreign plants; there are three gaseous diffusion plants operated for the Commission; nine plants are engaged in later stages of processing, and fourteen plants are engaged in fabricating nuclear fuel.[5]

The facilities engaged in preparing fuel for use in power reactors are either operated or licensed by the Commission. From the time when the raw uranium ore is pulverized at the mill, uranium is source material as defined by the Atomic Energy Act, and its possession or other dealing with it is required to be licensed under the Act.[6] Enrich-

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[3] See Hogerton, *Atomic Fuel* (U.S. Atomic Energy Commission 1967); Singleton, *Sources of Nuclear Fuel* (U.S. Atomic Energy Commission 1968).

[4] Statistical Data of the Uranium Industry, January 1, 1972 (USAEC 1972, Report No. GJO-100.)

[5] The Nuclear Industry 1971 (USAEC Report No. WASH-1174-71, pp. 5, 18, 20, 23, 26-7, 39).

[6] Atomic Energy Act of 1954, Secs. 11(z),(62), 42 USC 2014(z); 2092; 10 CFR 40. An exemption for unrefined and unprocessed ore is based on the Commission's finding that there is no need to license it from the standpoint of either public health and safety or the national security. See 10 CFR 40.4(h), 40.13(a)(b).

ment in the gaseous diffusion plants [7] creates special nuclear material as defined by the Act, as to which such activities are also required to be licensed.[8] Facilities dealing with source material are thus operated under license,[9] and those involved with special material are licensed as either production facilities or as utilization facilities.[10]

When in December of 1970 the Commission published amendments of Appendix D of Part 50 of its regulations, implementing the Environmental Policy Act (35 F.R. 18469, December 4, 1970; see also 35 F.R. 5463, April 2, 1970), it defined the scope of the procedures thus prescribed as extending to power reactors and fuel reprocessing plants (Appendix D, par. 1, 35 F.R. 18473). It also directed that compliance with the Environmental Policy Act be extended to other facilities handling source material and special nuclear material in the various stages of the fuel cycle:

> Procedures and measures similar to those described in the preceding paragraphs of this appendix will be followed in proceedings other than those involving nuclear power reactors and fuel reprocessing plants when the Commission determines that the proposed action is one significantly affecting the quality of the human environment. The Commission has determined that such proceedings will ordinarily include proceedings for the issuance of the following types of materials licenses: (a) Licenses for possession and use of

[7] The gaseous diffusion plants are owned by the Commission and operated for it by operating contractors. See Hiestand and Florsheim, *The Atomic Energy Commission Management Contract Concept*, 29 Fed. B.J. 67(1969).

[8] Atomic Energy Act of 1954, Secs. 11 aa., 53, 42 USC 2014 (aa), 2073, 10 CFR 70.

[9] 10 CFR 40.

[10] Atomic Energy Act of 1954, Secs. 11 v., 11 cc., 42 U.S.C. 2014(cc); 10 CFR 50.2(a), 50.2(m), 50.2(b).

> special nuclear material for fuel element fabrication, scrap recovery and conversion of uranium hexafluoride; (b) licenses for possession and use of source material for uranium milling and production of uranium hexafluoride; and (c) licenses authorizing commercial radioactive waste disposal by land burial. (Appendix D, 35 F.R. 18474, now par. A. 14.)

The Commission soon adopted regulations explicitly requiring that an application for a license to process and use source material which will significantly affect the quality of the human environment be accompanied by an environmental report under Appendix D, imposing compliance with Appendix D as a prerequisite for a license, and imposing similar requirements for special nuclear material licenses.[11] The consequence is that each significant licensed activity at each successive stage of the fuel cycle requires a separate environmental statement complying with the Environmental Policy Act and with Appendix D.[12]

There is no material difference between this reactor licensing proceeding and any other, and the intervenors do not appear to claim that there is. What they assert is that, notwithstanding the existing elaborate pattern of compliance with the mandate of the Environmental Policy Act at the various stages of the fuel cycle, it is the Commission's duty in this (and in every other) individual reactor licensing proceeding to take evidence upon and to consider the environmental consequences of every aspect of the whole fuel cycle.[13]

[11] 10 CFR 40.31(f), 40.32(e), 10 CFR 7.21(f), 70.23(h), 36 F.R. 12731, July 7, 1971.

[12] An exemption for unrefined and unprocessed ore is based on the Commission's findings that there is no need to license it from the standpoint of either public health and safety or the national security. See 10 CFR 40.4(h), 40.13(a)(b).

[13] As the so-called Mapleton intervenors put it:

> In general, Mapleton believes that all adverse environmental

The intervenors' suggested extension of the environmental study to uranium mining and tailings illustrates the extent of the remoteness and generality of what they contend must be analyzed in this proceeding, its lack of any specific relation to the project before us, and its departure from what we believe to be required by the Environmental Policy Act. The health aspects of uranium mining and the problem of tailings have been the subject of extensive consideration by Congress and by other public authorities.[14] We recognize of course that an agency's duty to conduct an environmental study is not limited by its statutory authority,[15] but the universality of what the intervenors claim and its remoteness from an environmental study of the specific project before us—the licensing of these two reactors—is perfectly plain.

The intervenors even seek to extend the environmental study in this proceeding to such subjects as the production of uranium by means not presently developed, such as the liquid metal fast breeder reactor.[16] The development of this

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effects and social and economic costs associated with the nuclear fuel cycle, to wit, mining, milling, feed material preparation, fuel enrichment, fuel fabrication, reactor operation, transportation, fuel reprocessing, and ultimate high-level radioactive waste storage and disposal should be considered in this proceeding.

Counsel for the intervenor Environmental Defense Fund and for the intervenors Saginaw Valley Nuclear Study Group and others explicitly concur in such an all-embracing view of the study to be undertaken.

[14] See Hearings, Use of Uranium Materials for Construction Purposes, October 28-29, 1971, and Summary Analysis of Hearings, 39-44, 12-13; see also P.L. 92-314, Title II, approved June 16, 1972; H. Rept. No. 92-1066, 92d Cong., 2d Sess., 7-8, 47-49.

[15] See *Natural Resources Defense Council* v. *Morton*, 458 F. 2d 827, 834-5 (D.C. Cir. 1972).

[16] The Saginaw Valley intervenors argue: "Since the proposed plant may rely upon nuclear fuel created by a Breeder, the risks

type of reactor is in its early stages, and is a matter of national policy [17] which has no specific relationship to the subject matter of this proceeding. The Commission has already published an environmental study of a demonstration fast breeder project.[18] Undertaking to weigh here its probable environmental consequences by the standards of the Environmental Policy Act and under the procedures of Appendix D would be an exercise in futility which would be duplicitous, premature and far beyond the reasonable scope of the present case. That would be even more true of such a study of other means under development.

We are deeply conscious that, in enacting the Environmental Policy Act, Congress intended that the phrase "to the fullest extent possible" in Section 102 should not be understood as authorizing the avoidance of the duties imposed by that Section, and that Congress intended that an agency comply with the directives in Section 102 unless existing law makes full compliance impossible. (See Conference Report, H.Rept. 91-765, 9-10). But, as we pointed out in the *Vermont Yankee* case, our duties under the Environmental Policy Act are defined by the proposed "project" or "action" before the agency. We cannot accept that it was the purpose of Congress, in adopting the Environmental Policy Act, to impose such a remote, conjectural and multiplicitous requirement on this proceeding as the intervenors assert, and as an inference to do so in every reactor licensing proceeding.

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and costs of the development and operation of Breeders must be analyzed against any alleged or asserted benefits, if any, that may be gained by construction and operation of the proposed Plant."

[17] See Message from the President of the United States Transmitting a Program to Insure an Adequate Supply of Clean Energy in the Future, June 4, 1971, 92d Cong., 1st Sess., H. Doc. No. 92-118.

[18] Environmental Statement, Liquid Metal Fast Breeder Reactor Demonstration Plant (April 1972, Report No. WASH-1509).

There is no way of ascertaining in the present proceeding what plants in the various earlier stages of the fuel cycle will be engaged in one stage or another of the production of fuel for this plant among others. There is no way in which one can now even tentatively identify, over the prospective life of the proposed installation spanning perhaps four decades, the specific mines, mills, refining and conversion plants, and fabrication facilities which will from time to time be involved in furnishing the fuel for these reactors.

In any case, we cannot believe that Congress intended that in the proceedings for the licensing of each individual power reactor there be conducted an environmental study of the present and future operations of an entire industry, including complex and perhaps unidentifiable operations performed by unidentifiable persons at unidentifiable locations under unidentifiable conditions. To embark on such a venture would plunge us into a labyrinth of indeterminacy. What we regarded in *Vermont Yankee* as impossible would here be ernormously compounded.

We held in the *Vermont Yankee* case that, under the principles enunciated by the Court of Appeals for the District of Columbia in *Natural Resources Defense Council* v. *Morton*, 458 F. 2d 827 (1972), the Environmental Policy Act is to be construed in the light of reason, and that the environmental study required by that Act for an individual power reactor does not extend to reprocessing and the ultimate disposal of wastes. We now conclude that, for the reasons expressed in the *Vermont Yankee* case and in this memorandum, the order of the Licensing Board dated March 10, 1972 should be affirmed.

It is therefore ORDERED:

1. Certification to the Commission of the order of the Atomic Safety and Licensing Board dated March 10, 1972 is denied;

2. The order of the Atomic Safety and Licensing Board dated March 10, 1972 is affirmed.

ATOMIC SAFETY AND LICENSING
APPEAL BOARD

WILLIAM L. WOODARD
Executive Secretary

Dated: July 19, 1972

LBP-72-34

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

Docket Nos. 50-329, 50-330

In the Matter of

CONSUMERS POWER COMPANY
(Midland Plant, Units 1 and 2)

HEADNOTE

The Atomic Safety and Licensing Board authorized issuance of a construction permit to Consumers Power Company for the construction of a dual purpose pressurized water nuclear power plant. The plant, consisting of two units will produce about 1300 megawatts of elctricity and also 4,050,000 pounds of process steam for sale to Dow Chemical Company's Midland plant, located on adjacent land. The permit is issued subject to any changes in the criteria for emergency core cooling systems and to undertakings by the Applicant to conduct a number of ecological studies and develop surveillance programs including a study of the intensity and extent of fogging and icing from the cooling pond.

APPEARANCES

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ROBERT LOWENSTEIN, Esq., and HAROLD REIS, Esq.
on behalf of Consumers Power Company, *Applicant*

MILTON R. WESSELL, Esq. and JAMES N. O'CONNOR, Esq.
on behalf of Dow Chemical Company, *Intervenor*

MYRON M. CHERRY, Esq.

on behalf of
Saginaw Valley Nuclear Study Group, Citizens Committee for Environmental Protection of Michigan, Sierra Club, United Automobile Workers of America, West Michigan Environmental Action Council, and University of Michigan Environmental Law Society,
Intervenors

WILLIAM J. GINSTER, Esq. and IRVING LIKE, Esq.
on behalf of Residents of Mapleton, *Intervenors*

JAMES A. KENDALL, Esq.
on behalf of Midland Nuclear Power Committee, *Intervenor*

WILLIAM H. WARD, Esq.
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on behalf of the Regulatory Staff of the Atomic Energy Commission

Initial Decision

I. BACKGROUND

1. On January 13, 1969, Consumers Power Company ("Applicant") filed with the Atomic Energy Commission ("AEC") an application for a license to construct and operate a dual purpose pressurized water nuclear power plant.[1] The proposed plant, designated the Midland Nuclear Plant, Units 1 and 2 ("Plant"), would produce approximately 1300 megawatts of electricity and 4,050,000 pounds of process steam for sale by Applicant to the Dow Chemical Company. It would be located on Applicant's approximately

[1] The Application and its 21 amendments are collectively referred to as the "application" or the "PSAR".

1200-acre site on the south shore of the Tittabawassee River in Midland County, Michigan.

2. Upon completion of the Staff review,[2] the AEC, on October 29, 1970 (35 *F.R.* 16749) published a Notice of Hearing pursuant to which a pre-hearing conference was to be held on November 17, 1970, and the hearing was to begin on December 1, 1970. On or before November 17, 1970, as required by the Notice of Hearing, petitions to intervene were filed by the Dow Chemical Company (Dow) and the Midland Nuclear Power Committee[3] in support of the application. Against the application, a joint petition to intervene was filed by the Saginaw Valley Nuclear Study Group, Citizens Committee for Environmental Protection of Michigan, Sierra Club, United Auto Workers of America, Trout Unlimited, West Michigan Environmental Action Council and University of Michigan Environmental Law Society (hereinafter collectively called "Saginaw Intervenors") and a separate petition by the Environmental Defense Fund (EDF).[4] These petitions were granted by the Board in its Order dated November 24, 1970. A late petition to intervene against the application filed by six residents of the community of Mapleton ("Mapleton Intervenors") was granted by the Board's Order of December 8, 1970.

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[2] Prior to completion of the Staff review, the application was reviewed by the Advisory Committee on Reactor Safeguards (ACRS), the ACRS Reports, dated June 18, 1970 and September 23, 1970 were admitted into the record (Applicant's Ex 4 and Ex 5) as required by law (42 U.S.C. § 2232(b)) for the sole purpose of showing compliance with the statute and not as evidence of the truth of any statement therein.

[3] The Midland Nuclear Power Committee did not actively participate in the hearing.

[4] Trout Unlimited and Environmental Defense Fund withdrew from the proceeding before the hearing on environmental matters. (Tr. 5685-86)

3. On December 1, 1970 the Hearing was begun for the purpose of receiving limited appearances. Limited appearances in favor of the application were made by the following individuals and organizations: Harold Krefft for Federal Power Commission; William G. Turney for Michigan Water Resources Commission; Donald E. VanFarowe for Michigan State Air Pollution Control Commission; James Woodruff for Michigan Public Service Commission; John A. Rapanos; Franklin E. Braman for Board of Directors of Downtown Bay City, Inc.; Hon. Julius Blasy, Mayor, City of Midland; Frank Olds, Chairman, Board of Commissioners, Midland County; Robert B. Chatterton, Supervisor Midland Township, Midland County; Dr. Sidney Smock for Midland Hospital Association; Fred L. Yockey, City Manager, City of Midland; Dr. Edward L. Kern, President, High Performance Technology, Inc.; Clifford Mapes, Vice Chairman, Midland County Road Commission; Ned Arbury, President, Arbury & Sons Insurance; Milton Getzendaner, President, Midland Nature Club; H. C. Allison, Vice President, Alden B. Dow Associates, Inc.; Fred Minzer for Minzer Realty; J. R. Buckely, Vice President, Mutual Savings and Loan Association; Roy Lanham, President, Brown Lumber, Inc.; John A. Miller; Alan Ott, Vice President and Director, Chemical Bank and Trust Company; Rev. Theodore M. Greenhoe for Memorial Presbyterian Church; Robert Ferries, President, Ferries and Maxwell Insurance Agency, Inc.; James G. Bandeen, President, Bandeen Chevrolet; Arthur E. Maass, Superintendent, Wastewater Department, City of Midland; Lyn DeVries for Midland Business and Professional Womens Club; Robert Parker, Executive Vice President, Midland Area Chamber of Commerce; William H. Meier, President, Meier Studio and Camera Shop; Robert Kingsley, Director of Elementary Education, Midland Public Schools; George B. Ulmer; Robert Copeland, Chairman, Midland Section, American Institute of Chemical Engineers; Lewis Warren, Executive Vice President, Greater Saginaw Chamber of

Commerce; William Demers, President, Lumber Dealers Association; Robert R. Denison, Airport Manager, Tri-City Airport Commission; Bruce R. Benway, Vice President, First National Bank; Larry Reed, Executive Vice President, Bay Area Chamber of Commerce; George Elleson, Bay County Industrial Development Corp.; and James L. Collison, Executive Director, East Central Michigan Economic Development District. Limited appearances opposing issuance of the construction permit were made by Georgena Goff and Wendell Marshall. Limited appearances expressing interest in procedural or safety matters related to the Plant but not opposing issuance of a construction permit were made by Thomas Doyle for Michigan Department of Natural Resources; Judith Boli for Sagniaw YWCA; William Foster; and Frederick L. Brown, President, Michigan United Conservation Clubs.

4. After the limited appearances, the hearing was adjourned to permit opposing intervenors to have discovery and prepare for the hearing. Among the contentions of opposing intervenors were several relating to "environmental" (as opposed to radiological health and safety) matters. Under the controlling regulations of the AEC, environmental issues could not be raised in the proceeding. On April 27, 1971, the Board held Intervenors' challenge to those regulations insufficient, thereby excluding all environmental questions from the proceeding.[5]

5. The hearing on radiological health and safety questions resumed on June 21, 1971, and continued on seventeen days until July 23, 1971, when it was adjourned.[6] Coin-

[5] Except as to the conformance of the Environmental Impact Statement with the Regulations, an issue which later developments made academic.

[6] At that time the hearing on radiological matters was substantially completed, except as to the question of the emergency core cooling system (ECCS). By Order dated March 10, 1972, the record

cidentally, on the same day the United States Court of Appeals for the District of Columbia (in *Calvert Cliffs Coordinating Committee* v. *AEC*, 449 F. 2d 1109 (1971)) held that the AEC regulations did not comply with the National Environmental Policy Act. (42 U.S.C. §§ 4321-49 (1970)). One effect of the *Calvert Cliffs* decision was to require that environmental matters be heard in pending proceedings, including this proceeding.

6. Following the adoption of new regulations, the AEC published, on December 4, 1971, a Supplemental Notice of Hearing on environmental matters. A timely petition for intervention on environmental issues by Steve J. Gadler was denied by the Board on February 9, 1972.[7] (By Order of March 31, 1972, the Atomic Safety and Licensing Appeal Board sustained the denial.)

7. On October 19, 1971, pursuant to the revised Regulations, Applicant duly filed its Supplemental Environmental Report (ASER).[8] This was followed by preparation of the Staff Draft Environmental Statement and the circulation of that statement for comment as required by law. The Final Environmental Statement (FES) was then prepared and notice of its availability was published on April 7, 1972 (37 CFR 7012).

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was closed on radiological questions except ECCS and the iodine spray removal system.

[7] On September 13, 1971, the State of Kansas petitioned to intervene to challenge the AEC decision to locate an ultimate high-level waste depository in Kansas. The Board permitted the intervention for the limited purpose of arguing the legal question whether high-level waste storage was an issue in this proceeding. By Order dated March 10, 1972, the Board ruled that high-level waste storage was not an issue in the proceeding, but referred its decision to the Appeal Board. The latter agreed. Kansas has not otherwise participated in the proceeding.

[8] Applicants' original Environmental Report (AER) was filed on July 24, 1970 under then controlling regulations.

8. Evidentiary hearings on environmental matters began on May 17, 1972, and ended on June 15, 1972, after fourteen days of hearings.

9. This proceeding is a contested proceeding within the meaning of the regulations. It should be pointed out, however, that Saginaw Intervenors who took the laboring oath in the radiological hearing did not participate in the environmental hearing and have not filed proper proposed findings[9] or conclusions even on radiological matters, although directed to do so by the Board's Order of June 28, 1972. Mapleton Intervenors' participation in the radiological hearing was relatively limited but they fully participated in the environmental hearing. Unfortunately, their proposed findings fall far short of the specification and detail required by the Regulations, and do not serve the purpose for which they were required.[10] As Applicant has noted both Mapleton and Saginaw are in default; as Applicant has also conceded, it is not clear what should be done about the default. The Board might, we suppose, strike the intervention and treat the proceeding as uncontested. This would not make sense in the circumstances. The opposing Intervenors by their participation strongly influenced the conduct of the proceeding and their work should not be ignored. On the other hand, we are troubled by the notion of opposing Intervenors that they can avoid the burden

[9] Saginaw did file a paper entitled "Proposed Findings of Fact and Conclusions of Law" but as to environmental issues they expressly state that "they have no conventional findings of fact to set forth." As to radiological issues, they state that they "have not chosen to search the record and respond to this proceeding by submitting citations of matters which we believe were proved or disproved." They do claim to reserve the right to take exception to any findings which the Board makes.

[10] The Board would like to note that the failure to propose proper findings and conclusions has greatly complicated the task of the Board and has made it virtually impossible in some instances to know whether particular issues are in fact contested.

of proposed findings and at the same time reserve the right to attack the Board's decision once made. We have concluded that the best course would be the following: We will treat as contested issues of fact those as to which intervenors introduced affirmative evidence or engaged in substantial cross examination. With respect to conclusions of law, we will attempt to deal with those questions which we understand to be raised by the proposed conclusions in the light of earlier contentions by the intervenors. We leave open the question of the effect of the failure to file adequate Proposed Findings and Conclusions for consideration when and if there are exceptions to our decision.

II. Radiological Health and Safety

10. The proposed reactors are of the pressurized water type, each with an ultimate power level of 2252 MWT. One of the reactors will be used solely for the production of electrical power (800 MWe); the other will produce approximately 500 MWe of electrical power and, in addition, supply steam for use in various manufacturing processes.

11. Applicant's proposed findings on radiological issues cover approximately 100 pages (out of a total of 267). While the Board has found these very detailed proposals helpful, it does not feel that it should respond in kind. The proposed reactors are substantially identical to a number of reactors previously licensed. The Board has reviewed the various aspects of the proposal, *e.g.*, coolant systems, leak detection systems, seismic design criteria, instrumentation, radiation monitoring, control room, flooding,[11] and finds that Applicant has submitted sufficient information and the Staff has conducted an adequate review

[11] With respect to flooding, the staff testified that it would review the Applicant's calculation of the probable maximum flooding during construction of the plant to assure that the calculational technique described by Applicant have been properly employed. (Staff Safety Evaluation ("SSE") p. 14)

of those aspects of the Plant. We do not believe it would be helpful, nor is it required that we do so, to comment in any detail on the standard features of the Plant, (except where an issue is contested). Instead we will devote our attention to those aspects of the proposal which are new or unusual, to contested issues, and to those specific matters as to which we are required to make findings.

12. The aspects of the Plant of primary interest stem from the fact that its dual-purpose nature requires that the reactor be located in close proximity to a large chemical plant, a plant which is heavily populated during work hours. The contested radiological issues are: meteorology and the related dose calculations; quality assurance; emergency procedures; and iodine spray removal systems.

13. The Plant site is located on the south shore of the Tittabawassee River in Midland County,[12] Michigan. The site consists of approximately 1200 acres of which a relatively few acres along the river will be utilized for Plant buildings and about 880 acres to the south of the area occupied by the Plant itself will be used for a cooling pond. The site is bounded on the north and east by the Tittabawassee River, on the south by Gordonville Road and on the west by farmland and scattered residences (PSAR Applicant's Ex. 1-A, § 2 and Figure 2-1).

14. Applicant has described the population density and use characteristics in the site environs (PSAR Applicant's Ex. 1-A, § 2.2.5 and 2.2.6). The areas directly across the river from the Plant to the north and east are occupied primarily by the industrial complexes of the Dow and the Dow Corning Company for a radius of one mile to one and one-half miles. The area beyond these industrial complexes to the north is occupied by the commercial and residential

[12] The site is presently in Midland Township; however an Order of annexation of the Township to the City of Midland has been issued and is presently in litigation.

areas of the City of Midland and the area to the east is a sparsely populated residential area containing many forested areas and scattered farms. The area to the south of the Plant is occupied by the cooling pond and other portions of the site for about one mile, is primarily forested for an additional two miles and primarily used for farming for another two miles. The first mile to the east of the Plant is industrial property owned by Applicant and Dow; the next mile is mostly residential and light farming; and the next three miles are sparsely populated and primarily agricultural. The area five to fifty miles from the site is primarily used for farming, where not forested, except for the industrial communities of Bay City, Saginaw and Flint (PSAR Applicant's Ex. 1-A, § 2.2.6). Projections of population growth have been made by Applicant for Midland County and surrounding counties based on material supplied by the Michigan Department of Commerce (PSAR Applicant's Ex. 1-A, § 2.2.5).

15. The required (10 CFR § 100.3(a)) exclusion area for the Plant has a radius of 0.31 miles (500 meters). The land within this area will be owned by Applicant except for a small portion which consists of a fenced-in waste treatment facility owned by Dow. Dow employees visit this facility only occasionally and Dow has agreed that Applicant may exercise the right to remove persons therefrom when required (PSAR Applicant's Ex. 1-A, § 2.2.4; Response to Staff Question 2.8, PSAR Applicant's Ex. 1-C, p. 2.8-1). The Board concludes that Applicant has the authority to "determine all activities" in the calculated exclusion area as required by 10 CFR Part 100.

16. The low population zone proposed by Applicant has a radius of approximately one mile (1600 meters) from the reactors. The area encompasses property owned and controlled by Applicant south of the reactors, a part of the Dow and Dow-Corning Company complexes to the north and east and a few residences in the southwest (PSAR

Applicant's Ex. 1-A § 2.2.5.5). The residential population within this zone is approximately 38 and the transient industrial or business population, primarily employees of Dow and Dow-Corning, is about 2145 (PSAR Applicant's Ex. 1-a, § 2.24; Tr. 3103, 3119, 3295). The residential population within the zone is well within acceptable limits. The size of the transient population is unusually large and the acceptability of the low population zone depends upon the ability to evacuate the Dow and Dow-Corning employees. Subject to what is said below (see Findings 31-33) with respect to evacuation plans, the Board finds the population zone satisfactory.

17. The distance from the reactor to the nearest boundary of the City of Midland is 0.21 miles, considerably less than the "population center distance" of one and one-third miles seemingly required by the Regulations (10 CFR § 100.11(a)(3)). However, in view of the fact that the population within one and one-third miles was largely limited to a transient population and that populous areas of Midland were sufficiently removed from the site vicinity, the Staff concluded that the reduced population distance was acceptable (SSE, p. 9; Tr. 2135-39, 2145, 2165). We concur.[13] The recently ordered annexation of Midland Township by the City of Midland will not affect the population distribution.

18. Applicant is a combination electric and natural gas utility incorporation under the laws of the State of Michigan. The Applicant will finance the total costs of constructing the Midland Plant as an integral part of its normal construction program, using funds internally generated (cash on hand, undistributed earnings and depreciation and other accruals) and from the sale of securities (debt, equity,

[13] Again, the acceptability of the reduced population distance depends on our conclusions as to the feasibility of rapid evacuation of the transient population, discussed at Findings 31-33 below.

and short-term notes) when and as required, in the same general manner as it finances other Plant additions. (PSAR Applicant's Ex. 1-D and 38E; SSE Appendix H, and Staff Ex. 8.)

19. Applicant has had long experience in building and operating fossil fuel plants and has gained experience in nuclear plants at its Big Rock Nuclear Plant and Palisades Plant. The Babcock and Wilcox Company (B&W) which will design and supply the nuclear steam supply system, and the Bechtel Corporation which will design and supply the remainder of the Plant, have had extensive experience in designing and constructing nuclear projects.

20. The application reflects that the activities to be conducted would be within the jurisdiction of the United States and that all of the directors and principal officers of the Applicant's organization are citizens of the United States. Applicant is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. The Applicant will rely upon obtaining fuel as it is needed from sources of supply available for civilian purposes, so that no diversion of special nuclear material needed for military purposes is involved (PSAR Applicant's Ex. 1-D; SSE p. 83, following Tr. 1674).

21. The AEC requires that data as to site meteorology be included in the PSAR for a construction permit. This information is used in evaluating the adequacy of plant site and plant design. The meteorological data are used in calculating the radiation dose which might be received over any given period of time by a person at the site boundary from normal operating or accidental airborne releases. Intervenors questioned the adequacy of the meteorological data with respect to the evaluation of the site under 10 CFR Part 100. In particular, they challenged the assumption as to diffusion rates used in that evaluation.

22. Two main sources of data were used by Applicant: The Dow Plant, which has recorded weather records for over ten years, and the Saginaw (Tri-City) Airport, about eight miles southeast of the site.[14] The Dow data was considered to be too incomplete for purposes of calculating diffusion models, and for that purpose Applicant used the more extensive, but more remote data from Tri-City Airport. (PSAR, Applicant's Ex. 1-A, p. 2A-4). In order to grant a construction permit, the Board is not required to find that the available meteorological data is complete (which it clearly is not). The Staff did not accept Applicant's data, but used, as is its practice, an arbitrary formula incorporating what it claims to be many conservative features. (SSE, p. 10). The Staff witness, an employee of the National Oceanographic and Atmospheric Administration ("NOAA") confirmed the conservatism of the assumptions in light of the general conditions in the area. (Tr. 3704). The testimony of Intervenor's witnesses, although there is some ambivalence, taken as a whole tends to corroborate the conservatism.[15] (Tr. 3406-3687). The Board is satisfied that the assumptions are sufficiently conservative to justify a reasonable expectation that the site is satisfactory.

23. Because of the absence of on-site data, the Applicant indicated it will conduct an on-site meteorology program with a continuous recording of meteorological data (wind direction, velocity and temperature lapse rate) until at least a year's history is obtained. (PSAR, Applicant's Ex. 1-c p. 1.00-1). Since the conclusion of the hearing, the AEC has promulgated Safety Guide No. 23, *Onsite Meteorology Programs*, describing the requirements of an acceptable on-site meteorological program, which is considerably

[14] A third source of some upper air data was U.S. Weather Bureau information from Flint, Michigan, about 50 miles southeast of Midland. (PSAR, Applicant's Ex. 1-A, pp. 2A-3 to 2A-4).

[15] For example, (at Tr. 3659) Dr. Epstein characterized the site as "being rather good from the point of diffusion by and large".

more extensive than that proposed by Applicant in the PSAR. The Board concludes that the Staff should require Applicant to conduct a meteorological program of the scope described in the Safety Guide No. 23. The program must be sufficient to validate the conservatism of the meteorological assumptions referred to above and can be developed and executed during the construction phase.

24. The application states that the reactor vessel, steam generator, and pressurizer will be designed, manufactured and tested in accordance with Section III of the ASME Code. (PSAR, Applicant's Ex. 1-A, § 4.5). Several types of nondestructive tests are to be performed during fabrication of the reactor vessel. These tests include radiography of welds, ultrasonic testing, magnetic particle examination, and dye penetrant testing. (PSAR, Applicant's Ex. 1-A, §§ 4.5.1 and 4.5.2). Surveillance specimens consisting of material representative of the reactor vessels are to be exposed in the reactor vessels to allow monitoring of the neutron induced nil ductility transition temperature shift. (PSAR, Applicant's Ex. 1-A, § 4.2.5.2).

25. The reactor coolant piping is to conform to the nuclear power piping code, USASI B31.7, and the reactor coolant pump castings are to be manufactured in accordance with Section III of the ASME Code, where applicable. (PSAR, Applicant's Ex. 1-A, § 4.5). All system components are to be designed to withstand normal loads of mechanical, hydraulic and thermal origin plus the forces that would result from the blowdown of the reactor coolant system as a result of a design basis loss-of-coolant accident, concurrent with the design basis earthquake loads. (PSAR, Applicant's Ex. 1-A, Appendix 5A). The proposed codes and standards for reactor coolant system components and piping comply with 10 CFR § 50.55a. The Staff has reviewed the codes, the plans for design and fabrication, and the quality specified for the reactor vessels and coolant piping

and concluded that the reactor vessels and coolant piping as planned are acceptable. (SSE, p. 20).

26. Finally, the quality assurance program calls for verification by the Applicant of the methods used by the vendor to certify that this equipment meets the specifications developed on the above bases. (SSE, p. 22).

27. The Staff and their consultants have reviewed and found the seismic design methods acceptable. Major core and core support components will be designed to provide assurance that they are not vulnerable to vibration. Confirmatory vibration testing will be conducted as part of the preoperational start-up program. The Staff has found acceptable the Applicant's plans and methods for limiting the vibration of the internal components. (SSE, p. 22; SSE, Appendix G).

28. A great deal of the discussion with respect to Quality Assurance by the Intervenors reflected a basic misunderstanding of the Board's function in this area at the construction permit stage. That function is to ascertain whether the Applicant has adopted a *program* of quality assurance, over which it will have final responsibility, and which, if implemented in accordance with the representations of the application, will satisfy the requirements of Appendix B of 10 CFR Part 50. The enforcement of the program is the responsibility of the Commission which has delegated the enforcement function to the Director of Regulation. The Board must assume that the Director of Regulation, through the Directorate of Regulatory Operations will require adherence to the quality assurance programs described in the application.

29. The record in this proceeding shows that Applicant is committed to a comprehensive, documented quality assurance program for which it will have final responsibility. The application contains a description of the program, including a discussion of how the applicable requirements of Appendix B of 10 CFR Part 50 will be satisfied. The Board has reviewed this information and concluded that if the program is implemented in accordance with the representation in the application, the requirements of Appendix B will in fact be satisfied. During the hearing, much additional information relating to the question of quality assurance was introduced into the record (Tr. 4009 et seq.). For example, the record includes manuals implementing the quality assurance program; Division of Compliance (now Directorate of Regulatory Operations) reports, noting, *inter alia,* some deficiencies in the Applicant's implementation of the program; and documentation relating to what the Saginaw Intervenors allege was inadequate quality assurance during the construction of the Applicant's Palisades Plant. The Board has considered this additional information, but only for the limited purpose of determining whether any evidence has been adduced which would be inconsistent with findings favorable to the Applicant on the ultimate issues in the proceeding. The Board has found no such evidence in the record.

30. A major objection of Mapleton Intervenors is that fabrication of the reactor vessels for this plant had been commenced and one of the vessels was approximately 50% complete at the time of the radiological hearing, and that the AEC's Division of Compliance had not yet inspected the reactor vessel nor made audits of the fabricator's documentation. There is nothing in the Regulations or in sound practice which prohibits the beginning of fabrication of the pressure vessel before the construction permit is granted. Nor is there any requirement that the Division of Compliance inspect the vessel during fabrication. A witness from the Division of Compliance described generally the steps involved in reactor vessel fabrication, the documentation accompanying each step and the testing of the reactor vessel at the end of fabrication (Tr. 4539-41). At the end of this procedure the Division of Compliance will audit

the documentation and make a physical inspection of the vessels (Tr. 4541, 4568-69). Any deficiencies will be brought to the attention of Applicant and it will be required to correct them (Tr. 4569).

31. Applicant submitted an emergency plan prescribing immediate action to be taken to minimize exposure of persons to radiation, both within the exclusion area and outside the exclusion area from any major accidental release of radioactivity. The emergency plan prescribed the actions to be taken in order of priority, the responsibilities of Plant personnel and summarized the personnel and materials available for assistance. The emergency plan took into account evacuation of the Dow Chemical and Dow-Corning plants in the event of a large accident and gave consideration to procedures in the event of an accident at Dow Chemical that could affect the Plant. (PSAR, Applicant's Ex. 1-A. Appendix 2C-1 through 2C-20).

32. Testimony at the hearing indicated that Applicant had prepared the plan prior to issuance of the AEC's "Guide to the Preparation of Emergency Plans for Production and Utilization Facilities" in early 1970, and prior to promulgation of Appendix E to 10 CFR Part 50. (Tr. 2243). Despite its acceptability to the Staff, the Board found this original plan inadequate, and so advised Applicant at the hearing. (Tr. 2258, 2271). Applicant thereupon revised its emergency plan based on its Palisades Plant operating license stage emergency plan and on more detailed contact with local agencies. (Tr. 2604-2615). The revised plan contains and incorporates the State of Michigan emergency plan, the Midland County Civil Defense Plan and Dow Chemical evacuation procedures. Appendix E to 10 CFR Part 50 requires the Applicant to include in the PSAR a "discussion of preliminary plans for coping with emergencies." The discussion is to include "sufficient information to assure the compatibility of proposed emergency plans" with the plant location. The purpose of this

requirement as we understand it is not to insist on specific proposals, but to give enough general information to indicate that a satisfactory plan is feasible.

33. In view of the "credit" taken by the Applicant in establishing the population center distance and the relatively high number of transients in the low population zone, the Board was particularly interested in the evacuation procedures of Dow and Dow-Corning. Considerable testimony on the Dow procedures was adduced at the hearing. (Tr. 2664-2683; 3047-3266). Notwithstanding the testimony of Saginaw Intervenors' witness (Tr. 4695-4821), based on experience elsewhere in uncontrolled situations, the Board is satisfied that timely evacuation is reasonably assured. However, the Board agrees with the Staff's view that advance planning should be done to protect the population in the low population zone and that such plans should be capable of expansion and mobilization of extra resources should a more serious accident occur. The Board is satisfied that the revised plan conforms with the requirements of Appendix E to 10 CFR 50.

34. The reactor building spray system is provided to remove heat and fission products from the reactor building atmosphere following a loss-of-coolant accident in order to limit the reactor building pressure to the design value and to reduce the post-accident level of fission products in the reactor building atmosphere. Chemicals are added to the water coming from the borated water storage tank after a loss-of-coolant accident to establish a basic pH by addition of sodium hydroxide and to provide for iodine retention by addition of sodium thiosulfate. (PSAR, Applicant's Ex. 1-A, § 6.2). The major question raised was as to the long-term stability of the sodium thiosulfate. In the Board's view, Applicant's testimony at the hearing confirmed the long-term stability of sodium thiosulfate solutions (Tr. 2836-55).

35. Electric power generated by the Plant is to be fed through separate connections to a main transformer for each unit. There, it is stepped up to 345 kV and delivered to a switchyard on separate overhead lines. The units and associated switchyard will be part of the Applicant's integrated elctric system. The Plant elctrical output also feeds the Plant station power transformers. The five 345 kV transmission lines which terminate at the Midland switchyard will provide startup and standby power from the system through a step-down substation (to change the voltage from 345 kV) and a Plant start-up transformer. A second Plant start-up transformer will provide an alternate off-site power source via another 138 kV substation. (PSAR, Applicant's Ex. 1-B, §§ 8.2.1; p. 8.2-2; SSE, pp. 41-42). The Plant has an auxiliary power distribution system which is a two-bus system for each unit. The engineered safeguards system bus sections are electrically separate and redundant and will be located in separate rooms of the auxiliary building to provide physical isolation. The redundant safeguard bus sections will have access to (a) the Plant electrical output through the station power transformers, (b) the off-site area transmission network, and (c) the onsite emergency diesel generators. (PSAR, Applicant's Ex. 1-B, § 8.2.2, SSE, pp. 42-43). The Plant's direct current power supply for safeguards systems consists of two 125-volt batteries located in separate rooms. Two separate 125-volt d-c power distribution buses will be provided to supply redundant safety related loads in each unit. These batteries will have the capacity to provide a safe and orderly hot shutdown in the event that all a-c power is lost. Separate 250-volt batteries will supply non-safety related loads on site. (SSE, p. 44-45).

36. The Saginaw Intervenors questioned whether there was sufficient redundancy and electrical independence in order to assure that electrical power would always be available to operate required safeguards equipment. Applicant's

testimony was that the design criteria for the two-unit Plant are satisfied by the two shared diesel generators and that their ability to perform their safety functions is not significantly impaired by such sharing. (Tr. 2330-2340).

37. The Board asked Applicant to indicate the experience of other industries with emergency generation and their redundancy requirements. (Tr. 2920-21). Applicant testified that no industry, except the nuclear industry, requires redundant emergency power sources although some airports have redundant systems. The absence of such a requirement appears to be based on the satisfactory performance of emergency power systems over the past twenty years. (Testimony of Witness Castleberry, filed August 16, 1971.)

38. The Staff has found the electrical system, including the backup diesel system adequate; however the Staff has required that test data be supplied to confirm the suitability of the diesel generators as an on-site emergency power source prior to the operating license review (SSE, p. 43).[18] We concur.

III. Emergency Core Cooling System (ECCS)

39. The sufficiency of the ECCS was contested by Intervenors from the outset of the proceedings and would, in the normal course of events, have been one of the radiological issues litigated in June and July 1971. On June 29, 1971, the AEC issued new rules governing ECCS in the form of "Interim Criteria for Emergency Core Cooling Systems for Light-Water Power Reactors" (36 *F.R.* 12247); the Criteria were amended on December 18, 1971 (36 *F.R.* 24082) to cover B & W reactors. In the meantime the AEC had on November 30, 1971 (36 *F.R.* 27774) pub-

[18] The Staff has also indicated that more detailed cable installation and additional design criteria will be required (SSE, p. 45).

lished a Notice of Rule Making Hearing on ECCS.[17] Both Mapleton and Saginaw Intervenors are parties to that hearing.

40. Intervenors do not contest the compliance of the proposed reactor with the Interim Criteria. The Staff has found that the proposed reactors do meet the criteria and the Board finds the Staff review adequate.

41. Intervenors do, however, challenge the validity of the criteria. Normally such a challenge would be made (under the Calvert Cliffs doctrine) by attempting to establish a sufficient case of invalidity to warrant the Board's referral to the Commission. Here, as the Board has pointed out in its Order of March 10, 1972, the usual practice would make no sense. The AEC has the issue before it; it is being vigorously litigated in the national ECCS hearing (Docket No. RM-50-1) and nothing but confusion would be added by our consideration of the issue here.[18]

42. We believe that this mode of proceeding is mandated by the AEC instruction that the pendency of the rule-making hearing should not affect the orderly resolution of the ECCS issue in licensing proceedings (37 *F.R.* 288). We also are of the view that no problems of public health and safety are created by so proceeding. Applicant will be bound to comply with any changes in criteria which may be adopted as a result of the national hearing. In any event, Applicant has committed itself to meeting any applicable ECCS regulation forthcoming from the proceeding and has furnished the Board with a compilation of dates by which major components involved in ECCS analysis are

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[17] The Interim Acceptance Criteria were promulgated without a rule-making hearing.

[18] Our conclusion is consistent with that of the Atomic Safety and Licensing Appeal Board in *Wisconsin Electric Power Company et al.* (Point Beach Nuclear Plant, Unit 2), ALAB-78 (November 10, 1972), at pp. 517-539 in WASH-1218(Suppl. 1).

needed at the site in order to meet a schedule of commercial operation in May 1977 (Applicant's letter of June 6, 1972). This schedule indicates that no major components involved in the ECCS analysis are needed at the site prior to the spring of 1974. Applicant in furnishing the list also agreed that unless the ECCS rulemaking had been completed earlier, none of those major components would be shipped prior to the date needed on site without prior AEC approval (Applicant's letter of June 6, 1972). Thus, if any modification in equipment is necessary, the equipment will still be in the shop where it can be more readily modified than if it had been shipped or installed.

IV. Environmental Issues

43. With respect to environmental questions the Board is required to do the following: (a) determine whether the requirements of the National Environmental Policy Act and Appendix D to Part 50 have been complied with, (b) independently consider the final balance among conflicting environmental factors in the record of the proceeding, (c) determine after weighing the environmental, economic, technical and other benefits against environmental costs whether the permit should be issued, denied, or appropriately conditioned, (d) (in a contested proceeding) decide any matters in controversy among the parties. By its Order to March 10, 1972, the Board ruled that it would not consider the environmental effects of the fuel cycle except in the following aspects: (1) the transportation of fuel elements from the fuel fabrication plant to the reactor site, (2) the transportation of spent fuel elements from the site to the fuel reprocessing plant, (3) the transportation of packaged radioactive material from the site to low-level waste burial grounds, and (4) radioactive discharges occurring at the site and any other environmental effects directly associated with the handling and use of the nuclear fuel at the site. That decision of the Board was upheld by the

Atomic Safety and Licensing Appeal Board. In reaching our decision we do not mean to suggest that there are no environmental costs associated with mining, fabrication and waste disposal. But we are not engaged here with an assessment of the entire atomic energy program and there is no meaningful way—except the cost of fuel—that we can assess those costs in this proceeding.

44. Environmental issues are a new area of responsibility for the Atomic Safety and Licensing Boards; as yet there are no precedents to guide the Boards and the regulations are vague as to how the environmental decision is to be made. In the hope that it will be helpful to Boards in other cases, we have attempted to describe in some detail how we have gone about deciding environmental issues. In the process we have treated some issues in more detail than is warranted by the evidence adduced in the hearing.

45. The difficulty lies in the direction to the Boards to independently consider the final balance after weighing the costs and benefits. "Final balance" and "weighing" costs against benefits have a deceptively mechanistic connotation, as though one could make a calculation of the costs and benefits and decide on the basis of the arithmetic. Obviously this is not possible. Calculations of costs and benefits may be a useful exercise, but more often than not the qualifications are so speculative and non-objective as to be worse than useless.

46. The chief benefits claimed by Applicant and the Staff are the production of electricity (and process steam) and the elimination of the air pollution from Dow's present fossil-fuel steam plant. The claim of production of electricity as a benefit is in turn premised on the need for additional electricity on Applicant's system. The demonstration of that need took the conventional format.

47. Applicant presented detailed electric sales forecasts through 1980, converted sales forecasts into estimates

of peak demand for electricity and related the projections to its existing generating capacity, its construction and retirement program and projections for the Michigan Electric Power Pool to demonstrate the need for electricity from the Plant. (ASER Applicant's Ex. 38F-1, Section 2; Applicant's Ex. 38G, revised Ex. 1 to Section 2; Applicant's Ex. 38K, pp. 108-114.) The projected increases in sales over the next ten years result from population increases, particularly large increases in the adult population which result in increased household formation, and increased usage per consuming unit, including significant increase in electricity being used for control or elimination of air and water pollution (ASER Applicant's Ex. 38F-1, pp. 2-6 to 2-9; Tr. 6528-33). The Staff has concluded that the projections of need are reasonable, and a witness from the Federal Power Commission (FPC) agreed (Tr. 8090-91). Intervenors do not seriously challenge the projections, although Mapleton made a weak try at eliciting a concession that the additional capacity was really to satisfy Canada's needs rather than local needs. We find that this "contention" is without foundation, and we conclude that Applicant's projections of need are reasonable. (ASER Applicant's Ex. 38G, Table DEM-1 to revised Ex. 1 to Section 2; Applicant's Ex. 38K, pp. 109, 111.)

48. Intervenors have suggested at various times that the Board must go behind the characterization of "demand" made by the Applicant to determine whether an appropriate alternative to satisfying the demand would be to set limits on particular uses of electricity. The Board declines to do so. So far as appears from the record, the postulated demand is made up of normal industrial and residential use and it is, in our view, beyond our province to inquire into whether the customary uses being made of electricity in our society are "proper" or "improper". The suggestion was also made that Applicant is stimulating demand by its advertising. No evidence was offered on this

point and absent some evidence that Applicant is creating abnormal demand, the Board did not consider the question.

49. Once the Board accepts the need and the "benefit" of satisfying that need, its conclusions on the cost benefit questions (although not as to alternatives) is, in our view, practically a foregone conclusion. It would require some evidence of special environmental damage to outweigh the benefit and there is no suggestion of such special damage in the record. Indeed if such evidence existed, it would probably be relevant to the question of alternatives rather than cost-benefit.

50. Nevertheless, we believe it would be instructive to review in some detail the subject of the cost of the damage to terrestrial ecology at the site. The evidence on this point was a substantial portion of Mapleton Intervenors affirmative case and the subject illustrates very well the nature of some of the problems posed for all concerned by the requirement that the costs and benefits be weighed and a balance struck.

51. As noted earlier, the site is adjacent to a large industrial complex and some residential property. There is nothing unique about it,[19] and in all likelihood, if not used for the proposed plant, it will be used for some other industrial, or possibly residential, development. Applicant's assessment of the impact of the plant on the terrestrial ecology is based on a survey performed by a team under the general supervision of Dr. Leslie Gysel of Michigan State University.[20] (ASER, following p. 3-1.) Applicant

[19] The Board visited the site and saw nothing to contradict Applicant's evidence as to the absence of unique characteristics.

[20] After the close of the hearing, Applicant offered a written statement of Dr. Gysel in reply to the testimony of Mapleton's witness Dr. Stuart Holcomb. Mapleton objected to the reception of Dr. Gysel's statement, and, asked that if it were to be received in evidence, the Board also consider a supplemental statement by Dr.

concededly did not attempt to identify every species of plant or animal at the site or to make detailed population estimates. Instead, it listed those wildlife species that had been personally observed at the site, those for which signs such as scat, tracks, etc. had been observed by local residents and plant site security personnel. The result of the survey is the conclusion that there are no special characteristics of the site of special value as a wildlife habitat.

52. Intervenors on the other hand challenge the survey as completely inadequate and assign a "conservative" value of $36,000,000 to the flora and fauna to be disturbed by construction. Approximately $30,000,000 of this amount is for losses of bird life and animal life alone. (Tr. 8563.) The method used to arrive at these evaluations was to estimate populations of species which would be expected to be found in the area on the basis of existing studies. Intervenors then estimated the number of each species expected to be found and assigned an arbitrary value to each bird and animal, for example, $10.00 per sparrow and $10.00 per mouse. Intervenors' witness, Dr. Stuart Holcomb, made no allowance for the effect of predation, although he conceded that predation would take a considerable toll. (Tr. 8592, 8596.) Nor did he make any allowance for the fact that many of the birds to be found are generally considered pests (indeed there are bounties in the State of Michigan on some of them). He then multiplied his final figure by 30 representing the expected life of the plant of 30 years. The Board finds this method of evaluation and calculation wholly insupportable. We note without further comment, for example, that the figures shown include $151,000 per year as the value of mice to be lost and

Holcomb. Both statements are essentially argumentative and no purpose would be served by re-opening the hearing to allow cross-examination. The Board understands the arguments of both sides, and for reasons which should be clear from the text is of the view that no further evidence would be useful.

$190,000 per year for varieties of sparrows—a total of some $10,000,000 over the life of the plant for mice and sparrows alone.

53. The testimony does however illustrate that a more elaborate survey of ecological effects on the plant site could have been made. The real question is at what expense and to what end. We agree with Dr. Gysel that a complete survey would be very expensive and, for some species, not even possible. We are not insensitive to the problems posed, but we believe that it is only realistic to accept the cost of the land as the cost of the ecological impact on the site, at least absent a showing of some special characteristics as to particular species or value of the tract of land as a habitat for wildlife. But even if we were to accept Dr. Holcomb's premise, and his arithmetic, the result would be no different. Given our prevailing values there is no way in which the loss of flora and fauna in a site of this kind can outweigh the benefits of supplying needed electricity.

54. Are the other disbenefits claimed by Intervenors substantial in comparison to the need for electricity? Those stressed by Intervenors include the threat of process steam contamination; the impact on aquatic ecology; the effect of releases of radioactivity during normal operation; the claimed "synergistic" interaction of releases of radioactivity with chemicals released from Dow; the effect of accidents; fogging and icing from the cooling pond; and the effect of decommissioning.

55. To the extent that the claimed disbenefits are based on releases of radioactivity within the limits permitted by the regulations, these contentions of Intervenors were treated during the radiological hearings as attacks on the regulations. Under the prevailing practice, such attacks can only be considered by the Boards for the purpose of ascertaining whether a sufficient showing of invalidity has been made to warrant referral to the Commission. For those

purposes, the showing was, in all cases, clearly insufficient. However, in the environmental hearing, the Board permitted testimony and cross-examination on such matters as pertinent to the cost-benefit analysis.

56. As originally proposed, the process steam supplied to Dow would have been produced via secondary heat exchangers. At an early stage, Applicant modified the proposal to provide a tertiary heat exchanger—further insulating the process steam from the possibility of introduction of radiation from the primary coolant. The process steam will be monitored for radioactivity with an on-line gross gamma monitoring system and with grab samples for gross beta. The tertiary steam to Dow will not contain more radioactivity than the Lake Huron makeup water supplied to the tertiary heat exchangers. (PSAR Applicant's Ex. 1-c, p. 11.00-2.) If any Dow products exceeds the inherent natural background radioactivity, the product will be decontaminated or disposed of as necessary. (Applicant's Ex. 38c.)

57. The Board finds that the system promises to provide assurance that leakage of radioactivity into the process steam will be an extremely remote possibility; that Applicant has submitted sufficient information; and Staff has performed an adequate review with respect to process steam monitoring. The environmental effects of the process will be insubstantial.

58. The liquid waste treatment system is designed to collect, process and reuse or dispose of off-site all liquid waste, except for laundry waste, containing radionuclides generated during normal operation of the Plant. (PSAR Applicant's Ex. 1-B, Section 11.) About 120 gallons per day will be the only waste containing radionuclides from the Plant that will be released to the Tittabawassee River during normal operation. The Applicant estimates that the gross activity in the dilution stream from this laundry

waste, based on operation with 1% failed fuel for a full year will not exceed 25 pico curies per liter on an annual average, i.e., equivalent to about two curies per year. (PSAR Applicant's Ex. 38-E, p. 11.1-1.) Using this upper limit concentration, the Applicant calculates a potential dose to a hypothetical individual who consumes 2200 cc's per day of water from the river and eats 37 lb of fish per year from the river to be about 0.8 mrem/year. (PSAR Applicant's Ex. 38-E, p. 11.8-11.)

59. Potentially high-activity waste-gas is routed to the waste-gas surge tank where its activity is monitored. In the event of high levels of radioactivity, the waste-gas is routed to waste-gas decay tanks where such gases can be stored for up to sixty days to permit decay of all of the radioactive gases, other than krypton 85, to essentially zero. (PSAR Applicant's Ex. 1-B, p. 11-7; ASER, p. 4.2-4A.)

60. Applicant estimated that in the event both reactors operate for a full year with 0.1% failed fuel, the quantity of Kr-85 and Xe-133 released through the radwaste treatment system will be about 1224 curies and 50 curies, respectively. The applicant further calculated the dose to an individual continuously present at the site boundary for a full year to be about 0.46 mrem/year. (ASER Applicant's Ex. 38F-1, Section 4.2.) A calculation of the dose using 60 days' holdup and 1% failed fuel would be approximately 4.6 mrem/year. This dose is a small fraction of 10 CFR Part 20 and is less than the dose specified in the proposed Appendix I to 10 CFR Part 50.

61. The solid waste treatment system consists of tankage and facilities for collecting and packaging spent demineralizer resins and evaporator bottoms and for packaging contaminated items such as spent filter elements, rags, clothing, etc. All radioactive material from the solid waste system will be shipped off-site for storage by AEC licensed contractors. (PSAR Applicant's Ex. 1-B, p. 11-8.)

In the Board's view, the environmental effects of the normal releases of radioactivity and disposal of solid wastes are minimal.

62. While no aquatic environmental studies have been conducted by Applicant or the Staff, there have been numerous studies conducted by the Michigan Water Resources Commission, Michigan Department of Natural Resources and by Dow over the years. (ASER Applicant's Ex. 38F-1, Section 3.2.2.)

63. The Michigan Water Resources Commission is implementing a program to improve discharges into the river and improve river water quality. The Tittabawassee River from Midland to its confluence with the Saginaw River is designated to be upgraded not later than January 1, 1974, for intolerant fish warmwater species and agricultural uses. (Tr. 5664-65.) Applicant will be required to conduct a thorough ecological study of the site and its environs prior to Plant operation to establish base line values as recommended by the Staff. Applicant has committed itself to discharges that are significantly lower than those permitted by the standards for thermal releases and total dissolved solids. The Board accepts the conclusion that the proposed use of Lake Huron water by the Plant will not create any incremental environmental effects. However, there will be some destruction of aquatic life in intake water from the Tittabawassee River. Because of the presently depressed quality of the river, the amount to be destroyed is conjectural,[21] but even after the river is improved, the aquatic life destroyed should not be significant.

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[21] Applicant submitted only a preliminary design of the intake structure for taking water from the river to the pond, pending the results of a study which it agreed to undertake as to the type and size of fish to be expected in the river after upgrading. The Board understands that the final design will incorporate the Staff's recommendation that the intake flow velocity should be less than one foot per second. (See Finding No. 77.)

64. Intervenors alleged that because of the unique location of the Plant adjacent to a large chemical complex, the effects of radioactive effluents from the Plant might combine synergistically with the effect of chemical effluents to produce a combined effect greater than the sum of the separate effects. The synergistic effects considered included both the physiological effect of combined dosages of the chemical and radiological effluents on the tissue of human recipients and the interaction of the radiological and chemical effluents in the environment to produce a reactant which could have a different effect on the human recipient.

65. Saginaw Intervenors requested a list of all chemical effluents discharged to both the air and water from the Dow complex. (Tr. 1500.) The Board ordered Dow to submit a list of effluents expected to be discharged from its facilities in 1975, the year in which the Plant was originally scheduled to start operation. (Tr. 1502.)

66. Although repeatedly invited to submit evidence in support of their claims of synergism, Saginaw Intervenors never did so. However, at the environmental hearing, Mapleton did produce three witnesses on the subject: [22] Dr. Richard Meierotto (Tr. 8248-8291), Dr. Carl Nordahl (Tr. 8487-8517) and Dr. Ernest Sternglass (Tr. 8360-8487).[23]

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[22] Technically, the evidence of synergism at the environmental hearing was admissible only as to the cost-benefit analysis. However, with respect to synergism, as indeed with respect to other safety questions, the Board was always receptive to any *affirmative* showing by Intervenors.

[23] After the close of the hearing, counsel for Mapleton requested (letter of June 21, 1972) that a letter written by Professor Morris H. DeGroot, which was referred to by Dr. Sternglass, be admitted as evidence of the belief of Dr. DeGroot that there is substantial probability that Dr. Sternglass' hypothesis correlating radioactive discharges with infant mortality is correct. Since Dr. Sternglass remarks on infant mortality were not relevant to synergism—about which he was supposed to be testifying—admission of the letter would serve no relevant purpose.

Viewed in the light most favorable to Intervenors, and without considering the countervailing evidence of Applicant and the Staff, the evidence fails to establish that, at the levels of concentration involved here, there will be any interaction which would tend to increase radiation effects from the Plant, or the chemical effects from Dow. And when one considers the testimony of Applicant and Staff witnesses, the evidence is overwhelming against a finding of "synergism".

67. Applicant furnished information with respect to potential public exposures to radioactivity from postulated accidents in the course of Plant operation. (ASER Applicant's Ex. 38F-1, as amended by Ex. 38G, Section 4.2.2.) The information submitted was in accord with guidance issued generally to Applicants by the Commission on September 1, 1971. The classes of accidents range from those that can be expected to occur during the life of the Plant and have trivial consequences to those that are never expected to occur but could have more severe consequences. However, those accidents with more severe consequences have a probability of occurrence so small that their environmental risk is extremely low. We will discuss the question of accidents again in connection with alternatives, but for purposes of the cost-benefit analysis, we find the cost to be minimal.

68. Mapleton Intervenors raised questions concerning the environmental costs of decommissioning the Plant at the end of its useful life. Neither Applicant nor its contractor has had any experience with decommissioning a nuclear plant. (Tr. 6893.) The AEC has had some experience although not with a plant of the proposed size. The Board is satisfied that decommissioning is possible. The environmental effects of the most likely (given today's technology) method of decommissioning do not appear substantial except for the loss of use of a few acres of land occupied by sealed buildings. The estimates of cost of de-

commissioning are quite speculative; however, the Board accepts as generally indicative of those costs Applicant's estimate of $35,000,000—present discounted worth $8,000,000 (Tr. 7820-21).

69. Mapleton Intervenors also contended that there would be substantial fogging and icing in the area around the cooling pond (including Mapleton). The evidence even of Mapleton's own witness does not support the contention. (Tr. 8317, 8322.) The effect on Mapleton seems likely to be negligible and even in the area close to the pond, the effects seem likely to be insubstantial and the environmental costs minimal. The evidence does, however, demonstrate the need for further study of the effects of cooling ponds and part of the surveillance program of Applicant (see Finding No. 77) should include a study of the duration, intensity and extent of fog and icing in the surrounding area.

70. As noted above, the Board is satisfied that the benefits outweigh the costs. The real question comes with respect to alternatives. Assuming that the power needs are to be met, are there better alternatives? The evidence demonstrates that there are no hydro sites available, that a pumped storage facility would not meet the load needs, that gas is not a viable alternative for power use, and that outside sources are unavailable. (ASER Applicant's Ex. 38F-1, Section 5.2.) The question of alternatives is then boiled down to a choice between nuclear and fossil (either oil or coal) fuel at the proposed location or at some other location.

71. So far as the choice between nuclear and fossil plants is concerned, the evidence demonstrates a considerable cost advantage of nuclear fuel over oil or coal. (ASER Applicant's Ex. 38F-1, Tr. 7011-42, 7917-23.) While long run cost estimates must be speculative, the Board is of the view that they are reasonable, and no contrary estimates were introduced.[24] But large as the estimated cost differentials are, they would not override any significant environmental advantages of a fossil fuel plant in this case. Are there such? The Board finds that there are not.

[24] The cost advantage probably reflects the relative scarcity of low sulphur coal and oil compared to uranium, so that the choice of nuclear fuel is also consistent with the objective of preserving scarce raw materials. However, the Board does not feel that the impact of a single plant on fuel reserves is sufficient to warrant a choice on that basis.

72. The major environmental effects of fossil fuel plants are the release to the atmosphere of fly ash and sulphur dioxide. By contrast, such air pollution from nuclear plants is essentially nil. Light-water moderated nuclear plants are less thermally efficient than fossil plants and discharge more waste heat in the cooling water. However, the use of a cooling pond or cooling tower will minimize the problem so that in the case of the proposed plant, the comparative disadvantage will be an increase in fogging and icing.

73. The major environmental effects from the nuclear plant are from releases of radioactivity in normal operation and from the possibility of accidents. The permissible releases of radioactivity in normal operation are now governed by Part 20 of the AEC regulations. The expected releases from this plant do not exceed Part 20 limits. However, under the regulations, we must take into account the enviornmental impact of radiation releases even within the standards. There are no known effects of radiation in the amounts contemplated to be released from this plant in normal operation, although it is assumed that there are genetic effects and that there may be cumulative effects of a combination of this radiation with other radiation. Weighed by a reasonable scale, these potential costs cannot tip the balance against nuclear power here. The major argument of intervenors is that not enough is known about the long-term effects of small doses and that the plant should not be licensed until such effects are known. This

really is an argument that no nuclear plants should be constructed until we know all that there is to know about low level radiation effects. Such an argument is untenable in light of the Atomic Energy Act. The judgment has been made there that atomic energy must be used for production of electricity and there is nothing in the National Environmental Policy Act which overrides that judgment.

74. Apart from questions of cost, the choice essentially narrows down to weighing the known environmental effects of fossil plants against the possibility of nuclear accidents,[25] indeed, against the possibility of a serious accident not contained within the reactor building. It is widely conceded that the possibility of such an accident is extremely remote. In our view so far as any particular reactor is concerned, the chances of a serious accident involving damage to the public is vanishingly small. This is not to say that such accidents will certainly never happen, but only that the odds of an accident happening at a particular reactor are incalculably small. For purposes of a cost-benefit analysis, we believe they must be taken as insubstantial.

75. Given the already substantial problem of air pollution in the Midland area, we conclude that nuclear power is clearly preferable to available alternatives.

76. Turning to the question of alternative sites, an important feature of the proposed project is its dual-purpose nature. In addition to supplying electricity for the Applicant's system, the plant will produce process steam for use by Dow. Applicant concedes that it would not locate the proposed installation at the proposed site but for this feature. It is thus necessary to consider as an alternative the location of the plant elsewhere and the independent

[25] The Board does not regard decommissioning as a substantial environmental problem; however, as noted above, it may be a significant cost factor.

supply of steam to Dow by some other source.[26] We have not considered, and we do not believe it is within our province to do so, the possibility that there might be environmental benefits from closing down some or all of Dow's operations. If the plant is not built where it is now planned, Dow will have to continue to produce its own steam. Since a small nuclear plant for that purpose would be extremely uneconomical (and would pose most of the same problems as the proposed reactor) as a practical matter, the result would be construction of a new fossil plant. Thus, any other site would have to demonstrate sufficient advantage over the proposed site to outweigh the air pollution from the new Dow fossil steam generating plant. Applicant had adduced considerable evidence that other sites available to it would not have any such advantage and no one else has suggested an alternative site for consideration. We conclude then that there is no preferable alternative.

77. Assuming that the proposed plant will be built at the proposed site, a final question is whether there is a preferable alternative cooling system for condenser water. An important consideration in this respect is that in order to supply coolant water in periods of low river flow, there will have to be a pond built at the location. The use of this pond for cooling thus has a natural cost advantage over cooling towers, all the cost of which would be supplemental to the cost of the pond. (FES, XI-2, 3). The Applicant discussed and the Staff considered the use of both dry and wet cooling towers. Neither form of wet tower (mechanical draft or natural draft) would offer any significant environmental advantages. The use of a dry tower would in the Staff's view eliminate fogging and icing and reduce water consumption, but these benefits would only be achieved at considerable cost in thermal efficiency as

[26] The evidence is clear that it is not economically feasible to supply steam to Dow from a plant at some other remote location. (Tr. 6857-6860.)

well as high capital costs. (FES, XI-37.) Those costs seem hardly justified to avoid the relatively small problem of fogging and icing expected—particularly in view of the lack of experience with dry cooling towers. We find that in the circumstances of this plant; the proposed cooling system is preferable to available alternatives.

78. The Staff's conclusion that the construction permit should be granted was subject to certain conditions. These conditions, which are set forth in Paragraph 7 of the Staff's Final Environmental Statement (FES), included a modification of the water intake design to minimize fish loss, the relocation of certain transmission lines, the conduct of ecological studies and development of surveillance programs, etc. Applicant has agreed to all of these recommendations except that in 7(f) of the FES which would have required Applicant to "prevent any discharge which would result in increasing the phosphorus concentrations in the river above 0.05 ppm". As a substitute for 7(f), Applicant has agreed to treat phosphates so that total discharge including laundry waste and start up waste based on the actual average will not exceed 35 pounds per day exclusive of the pond reconcentration of existing phosphate levels in the river. The Staff agreed to that substitution and the Board sees no reason why the proposal should not be satisfactory. The Board would like to note for the record that its conclusions are based on the understanding the Applicant will carry out the recommendations to which it has agreed.

79. The Board has reviewed the entire record of this proceeding, including the limited appearance statements and the proposed findings of fact and conclusions of law submitted by the parties, and replies thereto submitted by the Applicant. All the proposed findings and conclusions submitted by the parties which are not incorporated directly or inferentially in this Initial Decision are herewith rejected for the reason that there is not reliable, probative,

and substantial evidence in the record to justify their acceptance, or because they are unnecessary to the rendering of this Initial Decision.

V. Conclusions

80. Upon consideration of the record of this proceeding and the findings of fact and conclusions, the Board has determined that:

(1) In accordance with the provisions of 10 CFR 50.35(a):

> (a) The Applicant has described the proposed design of the facility including, but not limited to, the principal architectural and engineering criteria for the design, and has identified the major features or components incorporated therein for the protection of the health and safety of the public;
>
> (b) Such further information as may be required to complete the safety analysis and which can reasonably be left for later consideration, will be supplied in the final safety analysis report;
>
> (c) Safety features or components which require further development have been described and the Board has been assured the Applicant will conduct research and development to satisfactorily resolve any associated safety questions before the latest date stated in the application for completion of construction of the proposed facility.

(2) The proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public;

(3) The Applicant is technically qualified to design and construct the proposed facility;

(4) The Applicant is financially qualified to design and construct the proposed facility;

(5) The issuance of a permit for the construction of the facility will not be inimical to the common defense and security or to the health and safety of the public.

81. Upon consideration of the record of this proceeding and the findings of fact and conclusions, the Board has determined that in accordance with the provisions of Section A.11 of Appendix D, 10 CFR 50:

(1) The requirements of Section 102(2)(C) and (D) of the National Environmental Policy Act and Appendix D of 10 CFR 50 have been complied with in this proceeding;

(2) The appropriate action to be taken is to authorize issuance of the construction permit.

VI. Order

82. Wherefore, pursuant to the Atomic Energy Act as amended, and the Commission's Regulations, IT IS ORDERED that the Director of Regulation is authorized to issue a construction permit to Consumers Power Company. IT IS FURTHER ORDERED, in accordance with Sections 2.760, 2.762, 2.764, 2.785, and 2.786 of the Commission's "Rules of Practice", that this Initial Decision shall be effective immediately upon issuance and shall constitute the final decision of the Commission subject to the review thereof pursuant to the above-cited Rules.

Atomic Safety and Licensing Board

Arthur W. Murphy, *Chairman*

Clark Goodman

David B. Hall

Issued at Washington, D. C.,
this 14th day of December 1972.

ATOMIC ENERGY COMMISSION REPORTS

Volume 6

Opinions and Decisions of the
Atomic Energy Commission
with Selected Orders

January 1, 1973, to December 31, 1973

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

Atomic Safety and Licensing Appeal Board

Alan S. Rosenthal, *Chairman*
Dr. John H. Buck, *Member*
William C. Parler, *Member*

In the Matter of
Consumers Power Company (Midland Plant, Units 1 and 2) — Docket Nos. 50-329, 50-330

Mr. Harold F. Reis, Washington, D.C., for the applicant, Consumers Power Company.

Mr. Myron M. Cherry, Chicago, Illinois, for the Saginaw Intervenors (Saginaw Valley Nuclear Study Group, *et al*)

Mr. Irving Like, Babylon, N.Y., for the Mapleton Intervenors (Nelson Aeschliman, *et al*)

MR. MILTON R. WESSEL, New York, N.Y., for Intervenor, Dow Chemical Company.

MR. DAVID E. KARTALIA, for the AEC Regulatory Staff.

Memorandum and Order

(ALAB-101)

By initial decision dated December 14, 1972, the Atomic Safety and Licensing Board authorized the issuance of a construction permit to Consumers Power Company (the applicant) for the Midland Plant, Units 1 and 2.

Thereafter, on January 7, 1973, the Saginaw Intervenors filed with the Licensing Board a motion, with a supporting affidavit, seeking "to require the presiding officer to recall and revoke the initial decision and to declare the • • • Licensing Board biased." The claim of bias was premised in large part on the views expressed by Arthur W. Murphy, Chairman of the Licensing Board, in an article which he authored and which appeared in the October, 1972 issue of the Columbia Law Review.[1] Because of the asserted bias, the intervenors sought to have a new licensing board appointed, "with instructions to have a new hearing on all relevant issues." By Order dated February 1, 1973, the Licensing Board denied the motion.

On January 15, 1973, after the filing of the motion to recall but before the Licensing Board's denial of that motion, the Saginaw Intervenors filed exceptions to the initial decision. One of these exceptions (VI. B) asserts that the Licensing Board was "personally biased against intervenors" and that it "prejudged contested issues"; the

[1] Arthur W. Murphy, *The National Environmental Policy and the Licensing Process: Environmentalist Magna Carta or Agency Coup de Grace?*, 72 Columbia Law Review 963 (October 1972).

As will appear later, the bias claim was also directed to certain statements made by other members of the Board.

exception cites in particular the same Columbia Law Review article. The intervenors referred to a footnote in their previously filed motion to recall, which had recited their intention to treat the motion as denied if they had not received advice to the contrary by January 15, 1973, the last date on which intervenors could file exceptions to the initial decision; and they take exception to such "denial."[2]

Although the Saginaw Intervenors' motion to recall was not formally designated as a motion for disqualification, within the meaning of 10 CFR § 2.704(c), we regard it as such, despite the question which has been raised concerning the Licensing Board's jurisdiction over that motion.[3] Denial of such a motion by the Licensing Board (assuming it had jurisdiction over the subject matter) operates automatically to refer it to the Commission, and hence to us,

[2] Our consideration of this exception should not be taken as signifying our approval of the manner in which it was presented. The intervenors were not entitled to demand that the Licensing Board act upon the motion to recall prior to the expiration of the time for filing exceptions to the initial decision; nor were they entitled to treat their motion as having been denied if it were not acted upon within that time. Instead, the intervenors need only have (1) filed the motion to recall, unaccompanied by any purported directive to the Licensing Board concerning the timing of its decision on the motion; and (2) if—as occurred—their motion to recall was still pending as the time for filing exceptions approached, included in their exceptions one protecting against the possibility that the motion would be denied.

[3] The applicants argued, both before the Licensing Board and in their motion to us of January 9, 1973, that the Licensing Board did not have jurisdiction, after issuance of the initial decision, to act upon the recall motion. The staff argued that the Licensing Board retained jurisdiction under 10 CFR § 2.717(a), and it recommended that the Board exercise that jurisdiction to "ensure that if the Appeal Board is presented with the question of bias, the Appeal Board would have the full benefit of the ASLB's views on the matter." (Answer of AEC Regulatory Staff to Saginaw Intervenors' Motion, at p. 4.)

for review.[4] Since the issue of alleged bias and prejudgment is before us at least on exceptions to the initial decision, we need not determine the jurisdiction of a licensing board to entertain a motion to recall. In passing upon the claim of bias and prejudgment, we have, however, examined and considered all the documents bearing upon this claim which were filed by the parties.

Those documents reflect that the Saginaw recall motion was supported by the Mapleton Intervenors (who did no more than advise the Board of their support). It was opposed by the applicant, the AEC Regulatory Staff, and Intervenor Dow Chemical Company. The applicant argued that the motion had not been filed on a timely basis; and that, even if it were regarded as timely, it failed to put forth any valid grounds for disqualification. The staff advanced similar arguments. Dow opposed the motion primarily on the basis of timeliness.

With respect to the Saginaw Intervenors' exception VI. B, the applicant has urged that it be rejected. It generally asserts the same grounds on which it opposed the recall motion. But it also contends that the additional "evidence" of bias appearing in the exception was in fact a restatement of certain actions of the Licensing Board with which the intervenors disagreed and to which they had objected on the merits in other parts of their exceptions. The staff has indicated that the exception is "entirely without merit" and that it "generally" concurs in the applicant's comments.

For reasons hereinafter set forth, we have found (1) that the issue raised by the recall motion, as well as by the Saginaw Intervenors' exception VI. B, was not asserted in a timely manner, and (2) even if it had been timely asserted, there has been presented no bias which would require us to disqualify Chairman Murphy or either of the other members of the Licensing Board.

[4] *Northern Indiana Public Service Co.* (Bailly Generating Station, Nuclear 1), ALAB-76, WASH-1218 (Suppl. 1) 510 (October 30, 1972).

I

As is made eminently clear in their motion to recall and their exceptions to the initial decision, the intervenors' claim of bias is premised largely upon the views expressed by Chairman Murphy in his Columbia Law Review article. That article is a study of the impact of environmental legislation on the reactor licensing process. It was initially prepared as a report to the Committee on Licenses and Authorizations of the Administrative Conference of the United States. It adopts the general point of view that the National Environmental Policy Act (NEPA), or at least certain judicial constructions thereof, have imposed a burden on the reactor licensing process with which it cannot effectively cope. As illustrative examples of situations arising under NEPA which the author views as inconsistent with the current licensing structure, the article refers to certain assertions made in the *Midland* proceeding, as well as the litigation strategy adopted by intervenors in some cases.

The Saginaw Intervenors assert that the Board as a whole, but particularly Chairman Murphy, was "infused by a personal bias," thus rendering the initial decision a nullity. As evidence of bias the intervenors cite, in addition to the Columbia Law Review article, several selected rulings or record statements of the Licensing Board or its members. These will be discussed in greater detail later in this opinion (*infra*, pp. 65 and 66).

In their exceptions before this Board, the Saginaw Intervenors elaborate on the assertions which they had previously made before the Licensing Board. They characterize the article as showing a misunderstanding of the obligations of NEPA and a bias against enforcing that stat-

ute's mandate, and point to several parts of the initial decision where they believe that misunderstanding and bias to be manifested. Finally, they argue that disqualification does not require a showing that the bias of the Board members in fact affected the decision, but only that is in fact existed.

II

The assertions of the applicant, the staff, and Dow concerning the timeliness of the motion are founded on the purported knowledge of counsel for the Saginaw Intervenors (Myron M. Cherry) of the content of the law review article almost a year prior to the time that the recall motion was filed.

1. The article of course, appeared in the October, 1972, issue of the Columbia Law Review. Counsel for the Saginaw Intervenors states, in his supporting affidavit, that he did not receive a copy of that article until December 23, 1972, approximately a week after the issuance of the Licensing Board's initial decision.[5] In their motion, the Saginaw Intervenors assert that they "did not become fully aware until December 29, 1972, of the grounds of bias * * * and did not know until January 5, 1973 that the Regulatory Staff would itself refuse to take action consistent with this motion."[6] On the other hand, an affidavit of the counsel for Dow indicates that a copy of the October, 1972 issue of the Columbia Law Review was received in his office on November 6, 1972.[7]

But it is not relevant when counsel for the Saginaw Intervenors first learned of the law review article itself, because it is apparent that he should have become aware

[5] Affidavit of Myron M. Cherry, dated January 7, 1973, par. 4.

[6] Saginaw Intervenors' Motion, par. 3, p. 4.

[7] Affidavit of Milton R. Wessel, dated January 16, 1973, at p. 2.

of its general content, and of Chairman Murphy's views on the relationship of NEPA to the licensing process long before its formal publication. As we have indicated, the article itself evolved from an Administrative Conference report. The final report is dated August 1, 1972 but a first draft (which in relevant aspects is identical to the law review article) was circulated for comment to numerous interested persons and groups by letter of April 20, 1972 from the Chairman of the Administrative Conference.

Mr. Cherry was one of the addressees of that letter. His affidavit acknowledges that he became aware of the draft report "some time in the summer of 1972" but avers he did not deal with it at any great length because of his involvement in another proceeding.[8] In a supplement to their exceptions, the Saginaw Intervenors explained the delay from April, 1972 to the summer of 1972 on the basis that during the spring and summer, "Intervenors' counsel was spending full time in Washington, D.C. and thus was away from his office in Chicago."[9]

Whatever may have been the exact date on which Mr. Cherry became aware of the draft report, it seems clear that no later than the summer of 1972 he either was, or at the very least should have been, cognizant of the Board Chairman's views on the relationship of NEPA to the licensing process which later were published in the law review article.[10] Moreover, as the Board indicates in its denial

[8] Affidavit of Myron M. Cherry, dated January 7, 1973, par. 4, at pp. 3-4.

[9] "Motion and Supplement to Saginaw Valley, *et al.*, Intervenor's Statement of Exceptions to the Initial Decision filed on January 15, 1973," at p. 4. We agreed to consider this Supplement by our Order of January 23, 1973.

[10] We do not think it unreasonable to expect even a busy lawyer to take the time at least to peruse a received document in circumstances where (1) that document was authored by the Chairman of an adjudicatory tribunal before which he is representing a client

of the Saginaw Intervenors' motion, the Chairman and Mr. Cherry were co-panelists in November, 1971 at a session of an American Law Institute—American Bar Association Course of Study in Washington, D.C. at which both spoke on a number of the issues referred to in the law review article.

2. For motions for the disqualification of an adjudicator to be entertained, they must file in a timely manner. The Administrative Procedure Act, which applies to Commission licensing proceedings, explicitly so provides. 5 U.S.C. 556(b). The failure of a party to file a motion for disqualification once the information giving rise to such a claim is available to him amounts to a waiver of the disqualification objection. *Gilligan, Will & Co.* v. *S.E.C.*, 267 F.2d 461, 468 (2d. Cir. 1959). Moreover, as a matter of basic equity, a party in a proceeding such as this may not

> remain silent, await the decision of the Commission, and then, doubtless because of its disappointment, seek for the first time to asperse the objectivity of a quasi-judicial officer who joined in the challenged opinion.[11]

Any fair analysis of the Saginaw Intervenors' attempt to disqualify Chairman Murphy must lead to the conclusion that the Saginaw Intervenors are doing exactly what the *Safeway* court so explicitly disapproved. The issue raised by the Saginaw motion, as well as by exception VI. B., was clearly not asserted in a timely manner.

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in major litigation; and (2) it is obvious from the title of the document that its subject matter has a direct relation to that specific type of litigation.

[11] *Safeway Stores, Inc.* v. *Federal Trade Commission*, 366 F. 2d. 795, 802 (9th Cir. 1966).

III

While we would have been justified in rejecting the intervenors' claim of bias solely on the basis of the untimely manner in which it was raised, we have nevertheless also considered it on its merits, and are rejecting it on that basis as well. In this part of this opinion, we shall discuss the statutory and judicial authority which we believe to be governing; and, in part IV, we shall apply that authority to the questions which are before us.

The grounds on which a member of an adjudicatory body such as an Atomic Safety and Licensing Board may be disqualified are both well-defined and well-recognized. The principal source of the governing rules respecting such disqualification is the Administrative Procedure Act, which is specifically applicable to the Commission's licensing proceedings.[12]

The Administrative Procedure Act recognizes essentially two broad categories of conduct which may give rise to disqualification from a particular proceeding of an agency employee who has adjudicatory responsibilities in that proceeding. First, the Act provides for a separation of the adjudicatory functions within an agency from investigative and prosecuting functions.[13] Secondly, the Act requires that the functions of presiding officers (which would include the functions of members of Atomic Safety and Licensing Boards) be "conducted in an impartial manner," and that a presiding officer may be disqualified for "personal bias or other disqualifications."[14]

The statutory language which underlies the second, and far broader, of these categories of disqualification is simi-

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[12] Section 181, Atomic Energy Act of 1954, as amended, 42 U.S.C. 2231.

[13] 5 U.S.C. 554(d).

[14] 5 U.S.C. 556(b).

lar to that appearing in Section 21 of the Judicial Code,[15] which is applicable to the disqualification of federal district judges. The language is the outgrowth, as well as the subject, of a long line of judicial decisions. The basic rule has been elucidated by the Supreme Court in *In re Murchison* in the following terms:

> A fair trial in a fair tribunal is a basic requirement of due process. Fairness of course requires an absence of actual bias in the trial of cases. But our system of law always endeavored to prevent even the probability of unfairness. To this end no man can be a judge in his own case and no man is permitted to try cases where he has an interest in the outcome.[16]

From the judicial application of these general criteria to specific types of factual situations, there may be gleaned a number of identifiable types of conduct which have been viewed by courts as grounds for disqualification. Those will be described *seriatim:*

a. The first—and most obvious—situation calling for disqualification is one in which the adjudicator has a direct, personal, substantial pecuniary interest in a result which may be reached in a proceeding. *Tumey* v. *Ohio,* 273 U.S. 510 (1927).

b. Another equally obvious such situation is that where, in the terms of the Administrative Procedure Act, the adjudicator has a "personal bias." 5 U.S.C. 556(b). See also *Northern Indiana Public Service Co.* (Bailly Generating Station, Nuclear 1), ALAB-76, *supra,* at p. 511.

c. Under the specific provision of the Administrative Procedure Act, *supra,* an individual who has served a prosecutive function in a case may not thereafter serve in

[15] 28 U.S.C. 144.

[16] 349 U.S. 133, 136 (1955).

an adjudicative capacity, even though a substantial time period may have elapsed between his respective service in the two roles. Thus, the Chief Counsel and Staff Director of a Congressional Committee which conducted an investigation of the drug industry could not thereafter participate as a member of the Federal Trade Commission in a case involving the pricing practices of the same companies which were the subject of the Congressional investigation. *American Cyanamid Co.* v. *Federal Trade Commission,* 363 F.2d 757 (6th Cir. 1966).[17]

d. Prejudgment, as well as the appearance of prejudgment, has also been judicially recognized as a ground for disqualification; however, in fashioning the standard in this area, the courts have made it clear that the prejudgment which is proscribed is a prejudgment of *facts* in controversy *but not of legal issues.* Thus, in a landmark decision in this area, the Supreme Court found that the Secretary of Agriculture was not disqualified from participating in a proceeding on remand to his department, even though he had publicly criticized on policy grounds the court decision which had ordered the remand. Distinguishing sharply between the policy questions upon which the Secretary had spoken, and the factual issues which were to be considered by him on remand, the Court reasoned:

> That [the Secretary] not merely held, but expressed, strong views on matters believed by him to have been in issue, did not unfit him for exercising his duty in subsequent proceedings ordered by this Court.[18]

[17] See also *Texaco, Inc.* v. *Federal Trade Commission,* 336 F. 2d. 754 (D.C. Cir. 1964), vacated and remanded on other grounds, 381 U.S. 739 (1965); *Amos Treat & Co.* v. *S.E.C.,* 306 F. 2d. 260 (D.C. Cir. 1962). *Cf. Safeway Stores, Inc.* v. *Federal Trade Commission, supra; R. A. Holman & Co.* v. *S.E.C.,* 366 F. 2d. 446 (2d. Cir. 1966).

[18] *United States* v. *Morgan,* 313 U.S. 409, 421 (1941).

The Court also assumed that cabinet officers charged by Congress with adjudicatory functions were not "flabby creatures any more than judges are"; that "[b]oth may have an underlying philosophy in approaching a specific case"; and that "[b]oth are • • • men of conscience and intellectual discipline, capable of judging a particular controversy fairly on the basis of its own circumstances." [19]

The Supreme Court similarly has permitted members of the Federal Trade Commission to participate in a proceeding where it was charged that respondents had engaged in an unfair method of competition, and in price discrimination, arising out of a basing-point pricing system, even though the Commission had previously expressed views, in reports to Congress and in Congressional testimony, on the unlawfulness under the Sherman Act of the basing-point pricing system. As the Court stated:

> the fact that the Commission had entertained such views as the result of its prior *ex parte* investigations did not necessarily mean that the minds of its members were irrevocably closed on the subject of the respondents' basing-point practices.[20]

e. The federal courts have made it equally clear that the appearance of either bias or the prejudgment of factual—as opposed to legal—issues in controversy will disqqualify an adjudicator from participating in a proceeding. Thus, in two separate cases, the Chairman of the Federal Trade Commission was disqualified from participating in proceedings where he had previously made speeches which took a position on factual matters directly in controversy. *Cinderella Career and Finishing Schools, Inc.* v. *Federal Trade*

[19] *Ibid.*

[20] *Federal Trade Commission* v. *Cement Institute* 333 U.S. 683, 701 (1948); see also *Skelly Oil Co.* v. *Federal Power Commission*, 375 F. 2d 6 (10th Cir. 1967).

Commission, 425 F.2d 583 (D.C. Cir. 1970); *Texaco, Inc.* v. *Federal Trade Commission, supra.* In both cases, the court expounded its test for disqualification as being whether

> a disinterested observer may conclude that [the agency] has in some measure adjudged the facts as well as the law of a particular case in advance of hearing it.[21]

In emphasizing that the appearance of bias prejudgment is as valid a basis for disqualification as is actual bias or prejudgment, a court noted: "• • • an administrative hearing • • • must be attended, not only with every element of fairness but with the very appearance of complete fairness. Only thus can the tribunal conducting a quasi-adjudicatory proceeding meet the basic requirement of due process." *Amos Treat & Co.* v. *S.E.C.*, 306 F.2d 260, 267 (D.C. Cir. 1962).

Under this rule, actual bias or prejudgment need not be shown Indeed, the rule "may sometimes bar trial by [those] who have no actual bias and who would do their very best to weigh the scales of justice equally between contending parties." *In re Murchison, supra,* at p. 136. As one judge cogently remarked,

> We must presume that a fair hearing was denied if a disinterested observer would have reason to believe that the Commissioner had 'in some measure adjudged the facts • • • of a particular case in advance of hearing it.' [footnotes omitted].[22]

[21] *Cinderella Career and Finishing Schools, Inc.* v. *Federal Trade Commission, supra,* at p. 591; *Texaco, Inc.* v. *Federal Trade Commission, supra,* at p. 760 [in each case quoting language from *Gilligan, Will & Co.* v. *S.E.C.*, 267 F. 2d 461, 469 (2d Cir. 1959), cert. den. 361 U.S. 896 (1959)].

[22] *Texaco, Inc.* v. *Federal Trade Commission, supra,* concurring opinion of Judge Washington, 336 F. 2d at p. 764.

The rule governing the appearance of bias or prejudgment is ex-

In sum, therefore, an administrative trier of fact is subject to disqualification if he has a direct, personal, substantial pecuniary interest in a result; if he has a "personal bias" against a participant; if he has served in a prosecutive or investigative role with regard to the same facts as are in issue; if he has prejudged factual—as distinguished from legal or policy—issues; or if he has engaged in conduct which gives the appearance of personal bias or prejudgment of factual issues.

IV

As previously pointed out, the Saginaw Intervenors' claim of bias is premised largely upon the views expressed by Chairman Murphy in his Columbia Law Review article. But, as the Licensing Board indicated in its order of February 1, 1973 denying the claim of bias, the exact legal grounds on which disqualification is being sought are not entirely clear. The Licensing Board treated the claim as one of prejudgment since it was unaware of any circumstances which could give rise to a claim of personal bias—*i.e.*, the manifestation of animosity or partiality toward one or more of the parties or their counsel. Our review of the record convinces us that the Board was justified in so treating the claim.

What, then, might Chairman Murphy or other members of the Board have prejudged? As is clear from the affidavit of intervenors' counsel in support of the recall motion, the gravamen of interventors' complaints is that, before the *Midland* case had become ripe for adjudication, Chairman Murphy had reached certain conclusions. Specifically, according to counsel, he—"and hence the Board"—had decided that NEPA was "interfering with the production

pounded in greater detail in the opinion we are issuing today in the *LaSalle* proceeding, to the facts of which we have found that rule applicable. *Commonwealth Edison Co.* (LaSalle County Nuclear Power Station, Units 1 and 2), ALAB-102.

of needed energy and development of nuclear power" and, accordingly, had failed to fulfill the requirements of NEPA. For this proposition, the affidavit pointed solely to the law review article.

It is true, of course, that the article expressed skepticism regarding whether the requirements of NEPA could be fulfilled in the existing licensing process. But the exposition of such thoughts on legal matters was sanctioned by the Supreme Court in its *Morgan* and *Cement Institute* decisions, *supra*. Moreover, we note that the Licensing Board disclaims any belief on its part that NEPA is not to be enforced:

> • • • the Chairman, in his law review article, expressed the view that the present licensing structure is not adequately designed to handle the job which has been given to it by the legislature and the courts. The Board, notwithstanding the Chairman's view that the system is inadequate to the job, took the case as given to it and did the best job it could. [Licensing Board's Order at p. 4.]

We turn now to exception VI. B of the Saginaw Intervenors, which points to specific sections of the law review article as indicating prejudgment. Those sections discuss such matters as the ability of licensing boards to conduct a meaningful environmental review, the general utility of the Commission's operating license hearings, whether NEPA can be used to nullify an agency's regular mission. Again, these are legal issues, and not factual questions in dispute in this proceeding.

It is true that the Saginaw Intervenors emphasize a statement in the article concerning the inevitability of the need for a substantial increase in generating capacity[23] —which is a factual matter. Saginaw Intervenors assert

[23] 72 Col. Law Rev. at p. 963.

that the need for additional generating capacity is an issue in this proceeding. But even though Chairman Murphy may believe that "it seems inevitable that there will have to be a substantial increase in generating capacity, over the next ten years," it does not follow that the *Midland* facility—or indeed any other particular reactor—need be built. In this connection, we find nothing in the article or in the record to suggest that to any extent the Chairman related his general observations respecting increased overall electric power needs to the question as to whether the issuance of a construction permit for this specific plant should be authorized.

Reviewing the entire law review article, including each of the passages to which the Saginaw Intervenors have referred, we find no evidence of prejudgment of any facts in issue. Nor do we find any appearance of prejudgment. All that we find is an individual who may have certain crystalized views—indeed, who may possess an "underlying philosophy"[24]—on the application of NEPA to the Commission's licensing process. Previous decisions of this Board and the Commission have explicitly recognized this situation as nondisqualifying. Thus, in the *Bailly* case, we referred to Professor Davis' view, based on his analysis of the jurisprudence in this area, that "the fact that a member of an adjudicatory tribunal may have a crystallized point of view on questions of law or policy is not a basis for his disqualification."[25] And in an earlier decision, the Commission squarely ruled that

> Philosophic or professional attitudes or similar, generalized mental attitudes do not constitute disqualifying bias.[26]

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[24] *U.S.* v. *Morgan, supra,* at p. 421.

[25] *Northern Indiana Public Service Co.* (Bailly Generating Station, No. 1), ALAB-76, *supra,* at p. 511.

[26] *In the Matter of Long Island Lighting Co.* (Shoreham Nuclear Power Station Unit No. 1), Commission Memorandum and Order dated October 28, 1970, at p. 5.

Siganaw Intervenors additionally cite remarks by various members of the Licensing Board, and Licensing Board rulings, which are said to be "clear statements of bias."[27] Taken in context, none of the cited remarks or rulings in our view indicates any bias or prejudgment of facts in issue. To the extent, if any, that they may indicate a view on legal matters in issue, they are of course subject to our pending review on the merits, as is also the Board's approach and rulings in applying the dictates of NEPA to this proceeding.

V

We have determined that, measured against the settled principles relating to disqualification for personal bias or prejudgment, the law review article in question does not provide a legally sufficient basis for the invalidation of the initial decision of the Licensing Board in this proceeding. We do not, however, wish that conclusion to be taken as a tacit approval of the publication of that article by the Chairman of the Board. We make, therefore, these few additional observations.

We appreciate that the Chairman performs his adjudicatory function for the Commission on a part-time basis and that he has other significant responsibilities which are entitled to recognition. It is also true that, as previously noted, the genesis of the article was a report he had prepared for the Administrative Conference of the United States. But considerations of this nature do not lessen the distinct obligation of an adjudicator to exercise particular care to avoid doing anything—in a governmental or private capacity—which might erode public confidence in his ability to dispatch his quasi-judicial duties in an entirely dispassionate manner.

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[27] Affidavit of Myron M. Cherry, dated January 7, 1973, par. 10.

The fulfillment of this obligation may not wholly foreclose a widely-disseminated critique on the adjudicatory process of which he is a part, or on a statute (*e.g.* NEPA) which he is called upon to enforce. But we believe that greater circumspection might have been in order in this instance. In this regard, we have particular reference to the allusions in the article to the *Midland* case itself. Although these allusions may have been deemed perfectly innocuous by their author, it seems of doubtful prudence for an adjudicator to comment in such fashion upon any aspect of a case still before him for decision.

VI

For the foregoing reasons, we conclude that the Saginaw Intervenors' claim of bias or prejudgment was not submitted on a timely basis and, in any case, did not advance any valid reasons for disqualification of Chairman Murphy or either of the other Board members. Accordingly, the Licensing Board's Order Denying Motion to Recall and Revoke Initial Decision, dated February 1, 1973, is *affirmed*. The Saginaw Intervenors' exception to VI.B to the initial decision is *denied*, without prejudice to our later consideration on the merits of the substantive matters raised therein.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

MARGARET E. DUFLO
Secretary to the Appeal Board

Dated February 20, 1973

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

ALAN S. ROSENTHAL, *Chairman*
DR. JOHN H. BUCK, *Member*
WILLIAM C. PARLER, *Member*

In the Matter of
CONSUMERS POWER COMPANY (Midland Plant, Units 1 and 2) — Docket Nos. 50-329, 50-330

Mr. HAROLD F. REIS, Washington, D.C., for the applicant, Consumers Power Company.

Messrs. MYRON M. CHERRY and ROBERT GRAHAM, Chicago, Illinois, for the Saginaw Intervenors (Saginaw Valley Nuclear Study Group, et al.).

Mr. HAROLD J. VOGEL, Minneapolis, Minn., for the Mapleton Intervenors (Nelson Aeschliman, et al.).

Mr. MILTON R. WESSEL, New York, N.Y. (Mr. JAMES N. O'CONNOR, Midland, Mich., with him on the brief), for the Intervenor Dow Chemical Company.

Mr. DAVID E. KARTALIA, for the AEC Regulatory Staff.

Memorandum and Order

(ALAB-106)

By initial decision dated December 14, 1972, the Atomic Safety and Licensing Board authorized the Director of Regulation to issue construction permits to Consumers Power Company (applicant), for a dual purpose pressurized water nuclear power plant, designated the Midland Nuclear Plant, Units 1 and 2. The plant, which is designed to produce not only electricity but, as well, process steam to be sold by applicant to the Dow Chemical Company, would be located

on the south shore of the Tittabawasee River in Midland County, Michigan at a site adjacent to an existing plant of the Dow Chemical Company.

Separate sets of exceptions to the initial decision were filed by the Mapleton Intervenors and the Saginaw Intervenors. Responses in support of the initial decision were filed by the applicant and the AEC regulatory staff. The Dow Chemical Company, another intervenor, filed a memorandum indicating support of the responses filed by the applicant and staff. Oral argument was directed by our order of February 12, 1973 (ALAB-100) and was held on March 14, 1973. Each of the above-mentioned parties participated.

We have not at this time completed our consideration of all of the many issues raised in this case. We nevertheless have determined that, with respect to one particular aspect of the case—quality assurance and quality control (QA)—, prompt decision and action on our part are necessary. Based on our review of the record, including the relevant exceptions and responses thereto, and the oral argument, we have concluded that the initial decision reflects an erroneous view of the ambit of a board's responsibilities in the QA area and, as a result, inadequately deals with issues which have been raised in that area (see transcript of oral argument, pp. 46-47, 78-106, 122-136, as well as Saginaw Intervenors' Exception III.F.). Since we find the record sufficient for us to resolve those issues and to impose conditions which will satisfy applicable requirements, we hereby do so, and are modifying the initial decision to reflect both the additional findings and the supplementary conditions wihch we believe are necessary on this record.

I

One of the most significant elements of the Commission's "defense-in-depth" approach to nuclear safety is its emphasis upon quality assurance and quality control in the

construction of nuclear power plants. Under current regulatory provisions, every applicant for a construction permit is required by 10 CFR § 50.34 to include in its preliminary safety analysis report (PSAR) a description of the QA program to be applied to the design, fabrication, construction, and testing of the structures, systems and components of the facility. Specific criteria for QA programs are spelled out in Appendix B to 10 CFR Part 50. Among other things, the regulations require the description of the QA program to include "a discussion of how the applicable requirements of Appendix B will be satisfied," 10 CFR § 50.34(a)(7).

Before the Licensing Board, the Saginaw Intervenors raised the issue whether the applicant would be likely to implement properly the QA program. In this connection, there were introduced into evidence AEC inspection reports which described, *inter alia*, a number of deficiencies in the applicant's implementation of the QA program in connection with work under a previously granted exemption.[1]

The Licensing Board considered the issue of quality assurance and quality control in paragraphs 28 and 29 of the initial decision. The Board also made the ultimate findings required by AEC regulations as a predicate to the issuance of a construction permit, including those encompassing the technical qualifications of the applicant and public health and safety matters. (Initial Decision par. 80(3) and (5)). The Board held that its only function respecting quality assurance and quality control was to ascertain whether the applicant has adopted a QA program which, *if implemented in accordance with the representations of the application*, will satisfy the requirements of Appendix B. The Board found it to be the responsibility of the Director of Regulations—and consequently beyond the ambit of its own re-

[1] AEC Compliance Office Reports 329 and 330/70-1 through 329 and 330/71-1, introduced as Saginaw Intervenors' Exhibit 36 (Tr. 4571).

sponsibility—to assure that the program was in fact carried out as approved. (Initial Decision, par. 28).

The Licensing Board acknowledged that the AEC inspection reports in the record reflected, *inter alia*, some deficiencies in the applicant's implementation of the QA program in the construction activity which the applicant carried out under its exemption. The Board stated that it had considered these reports, but only for the limited purpose of determining whether there was "any evidence" which would be inconsistent with its making findings favorable to the applicant on the ultimate issues in the proceeding (e.g., technical qualification of the applicant, and whether issuance of construction permits would be inimical to the public health and safety). In that narrow context, it found "no such evidence."[3]

In Exception III. F., the Saginaw Intervenors challenge the Licensing Board's disposition of this issue, contending that the evidence in the record of "shoddy" QA practices demonstrates that the applicant is "incapable of, and cannot be relied upon to, perform adequate quality assurance and quality control."[4] Further, the intervenors assert that, as a matter of law, more must be shown than "merely the adoption of a plan in compliance with Appendix B"; that in addition there must be established "the workability of the plan and the probability that the applicant and the contractor will follow the plan."[4]

In their briefs, the applicant and staff supported the Board's approach. They took the position that only the program was in issue, and that details relating to enforcement were outside the scope of the proceeding.[5] But at the

[3] Initial decision, par. 29.

[4] Saginaw Intervenors' Exceptions, p. 53-24.

[4] *Id.*, p. 53-27 (fn. 15j).

[5] Applicant's Brief, p. 49; Staff's Brief, p. 28.

oral argument before this Board, both the applicant and staff modified this view: they now appear to concede the relevance of such reports, but only as to whether the applicant (including its architect-engineer) is technically qualified.[6]

II

We turn first to the question as to whether it is permissible for a licensing board, in a situation such as is here presented, to limit its inquiry—as the Licensing Board here did—to determining merely whether the applicant has adopted a QA program which, if implemented in accordance with the representations of the application, will satisfy the requirements of Appendix B. We conclude that, in the circumstances of this case, the Board was entitled to do so.

No QA program is self-executing. Thus, irrespective of how comprehensive it may appear on paper, the program will be essentially without value unless it is timely, continuously and properly implemented. This being so, it seems to us to follow that it is not enough for a licensing board to satisfy itself that, *if* implemented, the program described in the PSAR will adequately protect the health and safety of the public. At least where, as here, there has been a legitimate question raised in the course of the proceeding, the board must go on to inquire into whether there is, in fact, a reasonable assurance that the applicant and its architect-engineer *will* carry out the program in accordance with its terms. And, if the inquiry leads it to conclude that the record does not permit an affirmative finding on that score, it then becomes the board's responsibility to take whatever action is required—including possibly the outright denial of the construction permit—to provide some measure of assurance that there will not be an improperly

[6] AB Tr. 88-89, 123-126.

constructed facility which might present safety problems.[7]

The inquiry which the board must make is not necessarily resolved by a determination of whether, in a broad sense, the applicant and its architect-engineer are "technically qualified." A demonstration that technical qualifications do exist does not necessarily provide reasonable assurance that the QA program described in the PSAR will be faithfully fulfilled. To the contrary, as important as qualifications may be, of no less significant is the matter of managerial attitude. Unless there is a willingness—indeed, desire—on the part of the responsible officials to carry it out to the letter, no program is likely to be successful.

Based on these considerations, we hold that the Licensing Board viewed the scope of its QA inquiry, as expressed in paragraph 28 and 29 of the initial decision, too narrowly. In the context of the present proceeding, it was incumbent upon the Board to do more than simply ascertain, as it did, that if the QA program were implemented in accordance with the representations in the application, the requirements of Appendix B would in fact be satisfied. The Board also should have determined whether there was a reasonable assurance that the applicant and its architect-engineer would carry out the terms of the program.

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[7] We recognize, as did the Licensing Board, that, with respect to quality assurance (as well as other aspects of reactor construction and operation), the regulatory staff has on-going enforcement responsibilities to make certain that the permittee or licensee complies with all of the requirements imposed upon it. But this consideration scarcely affects a Licensing Board's duty, *prior* to authorizing a construction permit, to resolve legitimate questions relating to the likelihood that the applicant will fulfill those requirements. The presence of police officers on the highways is, after all, not deemed to justify the issuance of a motor vehicle license to a person who does not offer a reasonable assurance that he both can and will comply with the traffic laws which those officers are charged to enforce.

III

With these principles in mind, we now turn to a consideration of those portions of the record which bear upon the applicant's QA program. To begin with, we have found nothing which would cause us to overturn the Licensing Board's findings as to the consistency of the QA program with the requirements of Appendix B. We have reviewed the QA manuals for both the applicant and its architect-engineer. Both of these manuals, as presently revised, appear to present a satisfactory overall program to meet the quality assurance criteria of Appendix B. Insofar as implementation of the program is concerned, however, a review of the evidence in this case causes us serious concern.

The basis for this concern is illuminated by the contents of the AEC inspection reports in evidence. Compliance inspection of the Midland facility began on January 14, 1970, with a meeting held at the plant and attended by several representatives of the applicant and at least one representative of Bechtel Corp., the architect-engineer.[8] The purpose of the meeting was "to inform the applicant of the purpose, scope, and organization of the forthcoming intensive QA review of the QA program for the Midland project."

An initial QA inspection was made on March 10, 11 and 12, 1970,[9] in which the applicant's QA program itself was discussed and deficiencies then existing to the program described in terms of the various criteria of Appendix B. Some discrepancies were noted which involved Criteria II, IV, VI, IX, X, XI, XII, XIV and XV. A discussion of these discrepancies was held with the applicant's management personnel on April 7, 1970 in order to verify their understanding with regard to the QA program; the report reflect-

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[8] CO Report No. 329 and 330/70-1.

[9] CO Report No. 329 and 330/70-2.

ed that the applicant "indicated intent to resolve each of the deficiencies in a timely manner." [10]

A second inspection was held on May 1, 1970 [11] to "(a) review both CP and Bechtel's plans for site QA/QC activities, (b) determine extent of implementation, (c) review work performance and QC procedures and record keeping practices, and (d) determine the status of excavation efforts." QA programs for the Midland project covering such areas as excavations, foundation preparation, concrete placement and reinforcement steel were reviewed. During the day an inspection was made of the testing laboratory facilities and discussions held on the required QC documentation.

A further inspection was made on June 26, 1970, during which a detailed discussion was undertaken concerning the applicant's QA program. In particular, the discussion centered on the placement of concrete, and the applicant's QA audit involving such matters as air tests, cylinder tests, vibration of concrete, concrete temperature, clump-time, and pour records. The report of this inspection noted that the applicant on May 28, 1970 had requested an exemption under 10 CFR Part 50 to proceed with certain work prior to the granting of a construction permit.[12] The report further reflected Bechtel's intent, if such an exemption should be granted, to have several persons at the site who had expertise in such things as batch plant operations and concrete placement. According to the report, Bechtel stated its onsite personnel would collectively have the necessary qualifications to handle all of the work anticipated under the exemption. Similarly, the applicant stated that its staff "will be adequate to control the work contemplated under the exemption."

[10] CO Report No. 329 and 330/70-3.

[11] CO Report No. 329 and 330/70-4.

[12] CO Report No. 329 and 330/70-5.

The next inspection was made between September 29 and October 1, 1970, during which period work was proceeding under the exemption received by the applicant on July 30, 1970. The report of this inspection noted, *inter alia,* the following examples of nonconformance with the QA program:[13]

1. improper use of vibrators during concrete pours;

2. improper testing of the concrete by the site's testing laboratory;

3. improper sampling of the concrete for slump tests; and finally

4. "the QA and QC inspection personnel present at the concrete pour location did not promptly identify and correct apparent deviations from the ACI-301 Standard regarding consolidation of concrete."

It is apparent from the foregoing that the architect-engineer did not have properly trained construction personnel to handle the vibration of the concrete and that neither he nor the applicant had QA engineers on site sufficiently knowledgeable in concrete work to recognize the deficiencies in the procedures. As reflected in the inspection report, the architect-engineer and applicant once again stated that they expected to have properly trained crews and inspection on site for further operations.

The last inspection prior to shutdown of construction was made on January 7, 1971. At that time, the applicant was questioned about advance planning to "restore the site to full construction status when required." [14] A representative of the applicant stated that this planning was the architect-engineer's responsibility and that "he anticipated that it would include adequate steps to verify the integrity of the

[13] CO Report No. 329 and 330/70-6.

[14] CO Report No. 329 and 330/71-1.

existing structures, etc., before resuming construction." The inspection report states that "the applicant was urged to give consideration to this aspect of the facility shutdown status."

On the basis of the evidence summarized above, we find that neither the applicant nor the architect-engineer has provided reasonable assurance that the QA program will be implemented properly, even though both organizations have experience in building reactors. They have in this project not demonstrated their concern with maintaining QA programs in synchronization with their construction programs, nor have they demonstrated that they will have properly trained people on site to implement the QA program.

We deem it no answer that, as suggested by a staff witness, deficiencies such as the type disclosed here are "typical problems that occur" and "fall into a general category of problems that we do run into continually in our inspection work at Midland and other sites." [15] We would like to think that such failures to adhere to a QA program are not accepted as normal in reactor construction. In any event, the heart of the confidence in engineered safety features lies in the assurance that the quality of construction fully meets all specifications.

Despite the failure of the Board to deal adequately with QA issues, it did not reject any evidence offered on this subject. Moreover, the record not only includes extensive information on the QA aspects of construction but it also shows that the actual structural work which has been performed on the Midland plant appears to be satisfactory.[16]

[15] Tr. 4608-09.

[16] CO Report No. 329 and 330/71-1. This, of course, does not mitigate the seriousness of the deviations from proper quality assurance practices; since the Commission has accepted certain Code requirements as a necessary concomitant of proper quality assurance, the fact that structural deficiencies did not result must be accredited to pure luck or happenstance.

For these reasons, there would be little utility in remanding the case to the Licensing Board for further findings or evidentiary proceedings.

IV

Because of the history of the failure of the applicant and the architect-engineer to observe the required QA practices and procedures, as documented in this record, we have concluded that additional QA conditions must be imposed upon the applicant. These conditions, to which the outstanding construction permits are to be deemed subject, and which are to be considered as a predicate for the permits now to remain in effect, are as follows:

1. By April 9, 1973, or the date of resumption of construction activities (whichever is later), the applicant shall furnish a complete report to this Board, with copies to all other parties to his proceeding, on the quality assurance action being undertaken by the applicant and/or its architect-engineer to assure that the construction work already performed and the materials now on the site are in satisfactory condition. This report, in addition to covering actual construction work and materials, shall also cover inspection and calibration of instrumentation to be used in the QA program.

2. On the date specified in condition 1, *supra*, and on the first day of each calendar quarter thereafter, reports shall be submitted to the regulatory staff on the construction work to be performed during that quarter. Such reports shall contain the names of the QA supervisors and engineers of both the applicant and the architect-engineer who will be on site during the period covered by the report.

3. A statement of the QA qualifications of each individual named in the reports required by conditions 1 and 2

will be supplied in the report in which he or she is first mentioned.

4. A monthly nonconformance report covering the previous month's work will also be forwarded to the staff, with enough detail so that the reasons for the discrepancies, if any, will be apparent. When a discrepancy is discovered too near the end of the reporting period to permit determination of adequate corrective measures by the end of the period, the corrective measures shall be given in the next monthly report.

This Board requests that, for its information, copies of all reports required by conditions 2, 3, and 4, *supra,* be forwarded to it by the staff on a timely basis, together with any comments that the staff may have. This Board would also appreciate receiving staff comments on the report required by condition 1, and these comments should include the results of any staff inspection.

It is the expectation of this Board that the staff will closely monitor the activities of the applicant and architect-engineer with reference to the QA program described in the PSAR, as that program has been or may be amended. To this end, the staff's enforcement responsibilities are in no way limited by the conditions herein prescribed, and the staff is free to take any remedial action over and above these conditions which it may deem necessary.

V

Since we have not completed our consideration of the other exceptions which have been filed, and the other aspects of the initial decision, we express no view on them now. In taking this action, however, we do not wish to be understood as endorsing a practice of piecemeal review of licensing-board actions. Such review usually would be contrary both to views which we have previously expressed,[17] and

[17] *Wisconsin Electric Power Co., et al.* (Point Beach Nuclear Plant, Unit 2), ALAB-87, WASH-1218 (Suppl. 1) 578 (December 22, 1972).

to the spirit of the Commission's Rules of Practice.[18] In normal circumstances we would dispose of all of the issues posed by exceptions and by an initial decision in one opinion. Here, however, we viewed the evidence in the quality assurance area as constituting a special circumstance which warranted an unusual course of action—particularly our view of the possibly imminent resumption of construction and the concomitant importance of assuring adequate QA activities in connection with such construction. Hence, we factored out the single issue with which we have here dealt.

Accordingly, the initial decision, and the construction permits issued as a result thereof, are hereby modified to the extent indicated in this opinion. At a later date this Board will render a further opinion, disposing of the remaining exceptions.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

MARGARET E. DUFLO
Secretary to the Appeal Board

Dated: March 26, 1973

[18] Cf. 10 CFR § 2.730(f).

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

ALAN S. ROSENTHAL, *Chairman*
DR. JOHN H. BUCK, *Member*
WILLIAM C. PARLER, *Member*

In the Matter of
CONSUMERS POWER COMPANY (Midland Plant, Units 1 and 2) — Docket Nos. 50-329, 50-330

Mr. HAROLD F. REIS, Washington, D.C., for the applicant, Consumers Power Company.

Messrs. MYRON M. CHERRY and ROBERT GRAHAM, Chicago, Illinois, for the Saginaw Intervenors (Saginaw Valley Nuclear Study Group, *et al.*).

Mr. HAROLD J. VOGEL, Minneapolis, Minn., for the Mapleton Intervenors (Nelson Aeschliman, *et al.*).

Mr. MILTON R. WESSEL, New York, N.Y. (Mr. JAMES N. O'CONNOR, Midland, Mich., with him on the brief), for the Intervenor, Dow Chemical Company.

Mr. DAVID E. KARTALIA, for the AEC Regulatory Staff.

Decision

(ALAB-123)

On December 14, 1972, the Licensing Board issued an initial decision, authorizing the issuance of construction permits to the Consumers Power Company (applicant) for the Midland Plant, Units 1 and 2. Before us are separate sets of exceptions to that decision which were filed by the Mapleton and Saginaw Intervenors, as well as a Motion of the Saginaw Intervenors dated March 28, 1973, seeking to supplement the record on appeal with certain "newly discovered information."

We have heretofore considered and ruled on two of the Saginaw Intervenors' exceptions which we regarded as raising questions which should be decided prior to our resolution of the remaining issues encompassed by the myriad of exceptions filed. In ALAB-101, RAI-73-2 60 (February 20, 1973), we denied the Saginaw Intervenors' exception VI. B, insofar as it sought to disqualify the members of the Licensing Board because of alleged bias or prejudgment. Subsequently, in ALAB-106, RAI-73-3 182 (March 26, 1973), we disposed of the issue which had been raised with respect to quality assurance and quality control in Saginaw Intervenors' exception III. F. We now turn to the remaining issues.

An adequate description of the reactor under consideration, and of the procedural background against which we are responding to various exceptions, appears in ALAB-106, *supra*, and need not be here reiterated. Following our issuance of ALAB-106, the Saginaw Intervenors on March 28, 1973, filed with this Board a Motion and Supplement to their previously filed exceptions, seeking to supplement the record on appeal with "newly discovered information." That information consisted of a letter from the Advisory Committee on Reactor Safeguards (ACRS) to the AEC Chairman dated December 18, 1972, and a responsive letter dated February 3, 1973, both concerning the generic resolution of certain issues relating to the safety of light-water cooled reactors. The applicant and staff opposed the motion on grounds of lack of timeliness and of nonrelevance. While it is not clear exactly when the Saginaw Intervenors became aware, or should have become aware, of the exchange of correspondence, the letters in question are possibly relevant to certain of the Saginaw Intervenors' exceptions. That being so, and since in any event the letters are public records on file in the AEC Public Document Room of which

we may take official notice, we have considered them in reaching the decision we render today.

Based on our review of the entire record and for reasons hereinafter set forth, we find no occasion to alter the result reached in the initial decision. Accordingly, that decision, as modified by ALAB-106, is hereby *affirmed.*

I. Questions Relating to Intervenors' Failure To File Adequate Proposed Findings and Conclusions

Before reaching the merits of any of the specific exceptions which have been filed, we treat a question upon which the Licensing Board focused in its initial decision, and which also is discussed by the applicant in its briefs in opposition to the various exceptions—namely, the failure of either the Mapleton or Saginaw Intervenors to file adequate proposed findings of fact and conclusions of law, and the effect of such failure upon those parties' further participation in the proceeding.

1. As the Licensing Board pointed out, the Saginaw Intervenors participated in the radiological hearing but not in the environmental hearing; the Mapleton Intervenors fully participated in the environmental hearing but played a relatively limited role in the radiological hearing. In response to the Licensing Board's request, each group submitted what purported to be proposed findings of fact and conclusions of law.

The Saginaw Intervenors' submission, dated September 15, 1972, expressly stated with respect to environmental issues, which were considered in the phase of the proceeding in which the Saginaw Intervenors did not participate, that the intervenors had "no conventional findings of fact to set forth." Concerning radiological issues, where they played a significant role in developing the record, those intervenors stated that they "have not • • • chosen to search the record and respond to this proceeding by submitting citations of matters which we believe were proved or disproved."

The Mapleton Intervenors on September 14, 1972, submitted proposed findings and conclusions which covered both radiological and environmental matters but, as the Licensing Board indicated, fell "far short of the specification and detailed required by the Regulations."[1] We note in this regard that there was no record citation whatsoever for any of the 37 proposed factual findings, which in fact were little more than restatements of previously filed contentions.

The failure of both the Saginaw and Mapleton Intervenors to file adequate proposed findings of fact and conclusions of law highlights what we view as an area of concern in the functioning of the adjudicatory process in Commission licensing proceedings—i.e., the role of intervenors. Intervenors frequently enter Commission licensing proceedings, including this one, with broad and far-ranging contentions. They have been afforded, and have utilized, the full range of the Commission's discovery procedures. But, even after obtaining a plethora of information through discovery, they have presented limited direct evidence and have often confined their evidentiary cases to the conduct of cross examination. In this proceeding, they affirmatively failed to file adequate proposed findings and conclusions, even though they were asked by the Licensing Board to do so.[2] Now, after the Licensing Board has issued a decision with which they disagree in many respects, they file exceptions with this Board which challenge, *inter alia,* numerous factual findings of the Licensing Board.

Participation in this manner, in our opinion, subverts the entire adjudicatory process. One of the justifications

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[1] Initial Decision, at p. 10.

[2] "Post Hearing Order," dated June 28, 1972.

for public participation in that process is the additional input which intervenors may contribute to the identification and resolution of relevant issues, and the assistance they may provide an agency in fulfilling its statutory mandates.[3] In short, the right of participation in an administrative proceeding carries with it the obligation of a party to assist in "making the system work" and to aid the agency in discharging the statutory obligations with which it is charged.

Section 2.754 of the Commission's Rules of Practice, 10 CFR § 2.754, gives a party the right to file proposed findings and conclusions, and also provides that a board may require that they be filed. In doing so, the rule recognizes that the filing of proposed findings and conclusions by parties is likely to be of substantial benefit to a licensing board in resolving various questions which are at issue in a proceeding—particularly one such as this which involves complex factual questions and a lengthy record which includes a variety of expressed opinions on the various facets of reactor operation. If nothing else, such proposed findings will assist a board in determining what issues in fact exist between the parties, and what issues are either not actually in dispute or not relevant to the eventual decision which must be rendered.

Recognizing this, the Licensing Board here asked the parties for proposed findings and conclusions.[4] Compliance with this request might well have facilitated the decisional process in this case. For, as the Board noted, the failure of the Saginaw and Mapleton Intervenors adequately to comply with the request greatly complicated its task in

[3] *Office of Communication of the United Church of Christ* v. *F.C.C.*, 359 F. 2d 994, 1005 (D. C. Cir. 1966); see also Ernest Gellhorn, "Public Participation in Administrative Proceedings," 81 Yale Law Journal 359 (January, 1972).

[4] "Post Hearing Order," dated June 28, 1972.

reaching a decision, and "has made it virtually impossible in some instances to know whether particular issues are in fact contested."[5]

2. The Commission's Rules of Practice do not mandate a sanction for failing to file adequate proposed findings and conclusions, but do provide that such failure may be deemed a "default" and that "an order or initial decision may be entered accordingly."[6] In treating the intervenors' failure here as a "default," the Licensing Board opined that it could strike the interventions and treat the proceeding as uncontested.[7] It declined to do so, however, in view of the extensive participation of the intervenors in, and their strong influence on, the conduct of the proceeding. Expressing some reservation over a course of action which would permit intervenors to avoid the burden of preparing proposed findings and at the same time reserve the right to attack the Board's decision once made,[8] the Board nevertheless treated as contested issues of fact those to which the intervenors introduced affirmative evidence or engaged in substantial cross-examination; and, with respect to conclusions of law, it attempted to deal with those quesions which it understood to be raised by the proposed conclusions in the light of earlier contentions of the intervenors. The Board left open for our consideration ("when and if there are exceptions") the question of the effect of the intervenors' failure to file adequate proposed findings and conclusions.

Since we are obliged to review the Board's initial decision in this proceeding whether or not exceptions are filed, we are not inclined to dismiss a party from further partici-

[5] Initial Decision, par. 9, at p. 10, fn. 10.

[6] 10 CFR § 2.754.

[7] Initial Decision, par. 9, at p. 11.

[8] *Cf.* ALAB-101, RAI-73-2 60, at p. 63 (Feb. 20, 1973).

pation as a result of its failure to file proposed findings and conclusions. But that does not mean that we cannot take that failure into consideration in ruling upon exceptions filed by that party. Equity to the various parties to this proceeding requires that we accord the failure to file proposed findings some significance, to avoid the intolerable situation where a party may elect to

> remain mute and await the outcome of an agency's decision and, if it is unfavorable, attack it on the ground of asserted procedural defects not called to the agency's attention when, if in fact they were defects, they would have been correctable * * **

It is no answer that, as the Saginaw Intervenors' counsel pointed out at the oral argument before this Board, the Licensing Board refused to declare the intervenors in default.[10] As we have seen, the Board expressed its displeasure with the default of the intervenors but left it to us to consider an appropriate remedy. Furthermore, the contention of the Saginaw Intervenors that the Licensing Board unduly proscribed their activities and cross-examination and their right to discovery, so that there in fact was "no hearing" on the issues which they believe were significant,[11] is hardly persuasive. Many issues as to which the Saginaw Intervenors took a strong position were the subject of extensive consideration by the Licensing Board. At least as to those issues, the failure to file proposed findings represents a clear default. As to the others, we believe the Licensing Board was entitled to a post-hearing specification of areas in which the intervenors contend that errors were committed.

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[9] *First-Citizens Bank and Trust Co.* v. *Camp*, 409 F. 2d 1086, 1088-9 (4th Cir. 1969). See and compare *Easton Utilities Commission* v. *AEC*, 424 F. 2d 847, 851 (D. C. Cir. 1970).

[10] AB Tr. 10.

[11] AB Tr. 13.

Accordingly, while we do not exclude the intervenors from further participation as a result of their failure to file adequate proposed findings and conclusions, we shall take this failure into account, particularly in assessing the adequacy of the specific factual findings which have been challenged by the intervenors.[12]

II. Description of the Exceptions

The more voluminous of the exceptions filed are those of the Saginaw Intervenors. Covering some 195 pages, those exceptions are divided into 7 major sections: an introduction; separate sections dealing with procedural and substantive matters affecting the radiological portion of the decision (14 and 6 exceptions, respectively); similar separate sections dealing with procedural and substantive matters affecting the environmental portion of the decision (10 and 12 exceptions, respectively); another section dealing with matters affecting the entire initial decision (7 exceptions); and a final section containing one "miscellaneous" exception. The Mapleton Intervenors have filed 12 exceptions, 4 of which relate to the radiological portions of the decision, and the remainder of which concern environmental issues.

There is a significant amount of subject-matter overlap between the two sets of exceptions, and also between the exceptions filed in various categories of the Saginaw Intervenors' exceptions. In the interest of clarity, we have attempted to group the exceptions of both groups of intervenors into the subject-matter categories to which they appear to relate, and to deal with the exceptions on a given subject collectively.

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[12] While this discussion has been in terms of the obligations of intervenors, it goes without saying that other parties have the same obligation to file proposed findings and conclusions.

III. Function of Atomic Safety and Licensing Boards

In considering the substance of the numerous and broad-reaching exceptions which are before us, we first discuss an issue which is directly raised by two of the Saginaw Intervenors' exceptions, and the thrust of which pervades several others. This issue concerns the scope of the review performed by the Licensing Board.

1. The Saginaw Intervenors contend that the Board should have performed an "independent" review of all safety-associated issues (exception II.C.) and of all issues of an environmental nature (exception IV.A), whether or not the issue had been raised by any of the parties. They assert that the "Commission and the Board have an obligation independently to consider" all issues, both safety related and environmental, "whether contested or uncontested." In addition, with regard to environmental issues, the intervenors insist that the National Environmental Policy Act [13] (NEPA) and the *Calvert Cliffs'* decision [14] impose an obligation on an agency to "consider environmental values at each *stage* in the administrative process" and that the agency's sole designee for this purpose is the Licensing Board.[15]

As we understand it, the intervenors would have the Licensing Board perform a complete, *de novo* independent review of a license application—completely disregarding the review already undertaken by the regulatory staff. In this connection, they find error in the Licensing Board's having "failed aggressively to take the initiative with respect to the broad range of environmental values inherent in the proposal for the plant." [16] They conclude that

[13] 42 U.S.C. 4321, *et seq.*

[14] *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC*, 449 F. 2d 1109 (D.C. Cir. 1971).

[15] Saginaw Intervenors' Exceptions, at p. 55.

[16] *Id.*, at p. 56.

> the agency (and, hence, here the Licensing Board) must take the initiative and do its own analysis *even to the point of doing independent research.*[17]

2. As intervenors themselves acknowledge, their view of the function of a licensing board is at odds with that delineated by the AEC Rules of Practice. The Rules in effect at the time of the hearing provided, with respect to contested proceedings such as this one, that the board will resolve controverted issues as well as decide whether the findings requisite to a license authorization should be made, but that with respect to uncontroverted matters, the board is

> neither required nor expected to duplicate the review already performed by the regulatory staff and the ACRS and they are authorized to rely upon the testimony of the regulatory staff and the applicant, and the conclusions of the ACRS, which have not been controverted by any party.[18]

These provisions *permit* a board to accept certain testimony of the staff and applicant, and conclusions of the ACRS, on uncontested issues; although they do not—as the intervenors contend—*direct* a board to do so.[19] It is clear that the Board here in fact rendered an independent analysis not only of contested issues but also of those aspects of the application which it viewed as "new or unusual,"

[17] *Id.*, at p. 57 (emphasis supplied).

[18] 10 CFR Part 2, Appendix A, III.(g)(1). Similar requirements appear in the currently effective rules. 10 CFR Part 2, Appendix A, V.(f)(1), effective August 28, 1972.

[19] It is interesting to observe in this connection that the Saginaw Intervenors themselves, in their exception II I., fault the Licensing Board for allegedly *failing* to rely on the ACRS conclusions in noncontroverted safety areas—and thus, by inference, for acting independently. However, as we have seen, the regulations permit but do not require reliance on ACRS conclusions on uncontested matters.

whether or not contested.[20] In doing so, it conformed to the standards imposed by the Rules of Practice.[21]

3. A licensing board in a construction permit proceeding such as this is expected to evaluate independently and resolve the appropriate contentions of the various parties, to assure itself that the regulatory staff's review has been adequate, and to inquire further into areas where it may perceive problems or find a need for elaboration. If it finds itself not satisfied with the adequacy or completeness of the staff review, or of the evidence presented in support of the license application, it may, for example, reject the application, or may require further development of the record to support such application. In that connection, it may issue an order which in effect requires one or more of the parties to perform additional research. But for the Board to duplicate the role of the staff, or for it to perform independent basic research, is inconsistent with its adjudicatory role and beyond the scope of its delegated authority.

The intervenors have not brought to our attention any authority—and we are not independently aware of any—which would require the licensing board or other trier of fact in a construction permit proceeding to extend the scope of review contemplated under Commission regulations. In the environmental area, the *Calvert Cliffs'* decision, which is cited by the intervenors, made it clear that NEPA requires the Commission and other agencies "to *consider* environmental issues just as they consider other matters within their mandates."[22] The court did go on to

[20] Initial Decision, par. 11.

[21] Intervenors concede that the Licensing Board followed these standards, but they challenge the legality of those standards. (Saginaw Intervenors' Exceptions, at pp. 15-16, 58.) While it does not appear that this challenge was advanced below in accordance with the then applicable so-called *Calvert Cliffs doctrine*, we consider it on the merits, *infra* pp. 335-336. [Pp. 194-196 this appendix.]

[22] *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC, supra,* at p. 1112.

set forth its oft-quoted pronouncement that the Commission could not "simply • • • sit back, like an umpire, and resolve adversary contentions at the hearing • • •."[23] But that observation was prompted by then-existing AEC regulations which, among other things, precluded a board in a construction permit hearing from considering environmental matters unless they were raised as contested issues, even though the same board was permitted to consider radiological safety issues, whether or not contested. Far different regulatory requirements are governing here, which impose no such prohibition on a board's consideration of environmental matters.[24] Under these requirements, the Board in this proceeding considered certain environmental matters on its own initiative. *E.g.,* Tr. 7368-7542, 7556-72.

In sum, *Calvert Cliffs',* as well as the other cases cited by intervenors, require no independent research by the Board; moreover, they do not require the Board to duplicate the analysis previously performed by the staff. What *Calvert Cliffs'* requires is an "independent review of staff proposals" by the Board,[25] and conclusions independently arrived at on the basis of evidence in the record, including the staff's Final Environmental Statement.[26] The Board

[23] *Id.,* at pp. 1118-19.

[24] 10 CFR Part 50, Appendix D, as revised September 9, 1971 (36 *F.R.* 18071).

[25] *Calvert Cliffs' Coordinating Committee, Inc.,* v. *AEC, supra,* at p. 1118.

[26] *Greene County Planning Board* v. *FPC,* 455 F. 2d 412 (2d Cir. 1972), also cited by intervenors, invalidated FPC procedures which permitted the holding of a final hearing prior to the preparation of any environmental statement by the agency. The court held that the agency's statement must be considered at such a hearing. Here, the agency's final environmental statement was considered. The *Greene County* court specifically sanctioned the procedural requirement of AEC regulations (at p. 422).

performed that review in this case. Exceptions II.C and IV.A. are accordingly rejected.

IV. Limitation of Issues

Several of the exceptions of the Saginaw Intervenors take issue with various rulings of the Licensing Board which precluded them from raising, and presenting evidence and conducting cross-examination concerning, certain specified issues. In this portion of the decision we shall deal with these contentions *seriatim.*[27]

1. In exception II. B., the Saginaw Intervenors challenge the rulings of the Licensing Board which sustained the applicant's objections to answering two interrogatories (numbers 92 and 210) which had been propounded to it by the intervenors.[28] The exception asserts that, by upholding these objections, the Board "ruled that reactor pressure vessel failure and the probability of such failure were not issues in the proceeding" and "prevented the intervenors from raising a valid issue in the proceeding." [29] The intervenors further claim that such ruling foreclosed them "from securing information in order to make any showing of special circumstances." [30]

We disagree. Neither of the interrogatories called for an evaluation of the possibility or probability of pressure vessel failure. Rather, they *assumed* pressure vessel failure and called upon the applicant to describe and analyze potential consequences thereof. Thus, interrogatory 92 sought

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[27] Contentions that the Licensing Board did not permit intervenors to litigate certain ECCS issues are dealt with separately in Part V of this decision, *infra* p. 339. [P. 203 this appendix.]

[28] "First Set of Interrogatories of Certain Intervenors Directed to Consumers Power Co.," dated March 22, 1971.

[29] Saginaw Intervenors' Exceptions, at p. 10.

[30] *Id.*, at p. 11.

an analysis of the consequences of a situation in which a simultaneous loss-of-coolant accident and pressure vessel fracture were hypothesized. Interrogatory 210 was apparently directed to an analysis of the consequences of a situation where multiple failures of independent engineered safeguards were assumed—a situation comparable to that which was the subject of contention in the *Point Beach 2* proceeding which we specifically ruled did not raise the question of the likelihood or probability of a sudden pressure vessel rupture. ALAB-80.[13]

The Licensing Board itself obviously viewed the interrogatories in the context of an analysis of the consequences of rupture, since it sustained objections to each of them on the ground that

> the questions call for *analysis of the consequences* of an accident which if found to be a credible accident would require denial of the construction permit.[32]

The Commission has held that the issue of pressure vessel failure is not automatically to be considered in a licensing proceeding. In its Memorandum and Order in the *Indian Point 2* proceeding,[33] which the intervenors invoke as a basis for their contention that pressure vessel rupture is an appropriate issue for this proceeding, the Commission indicated that the probability of a rupture of the pressure vessel is so low that it becomes an appropriate area of inquiry in a licensing proceeding only upon a showing of "special circumstances." A showing of "special circumstances" requires more than a mere allegation thereof;

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[31] *Wisconsin Electric Power Co., et al.*, ALAB-80, WASH-1218 (Suppl. 1) 544 (Nov. 14, 1972).

[32] "Rulings with respect to objections to interrogatories," dated May 13, 1971, at pp. 1, 2 (emphasis supplied).

[33] *In the Matter of Consolidated Edison Co. of New York* (Indian Point Unit No. 2), Docket No. 50-247, Commission Memorandum and Order dated October 26, 1972.

and a Board is authorized to exclude contentions or challenges "which have no substantial or *prima facie* basis."[34]

Intervenors have made no showing of special circumstances which would warrant the Boad's consideration of the issue of pressure vessel rupture. Moreover, as we have seen, intervenors' interrogatories 92 and 210 were not designed to elicit inforamtion concerning special circumstances; their denial thus could not have the effect of foreclosing intervenors from securing such information. Therefore, intervenors' assertion that they were improperly denied discovery which would enable them to determine whether "special circumstances" exist is patently without merit.

Intervenors exception II. B. is accordingly denied.

2. In exception II. L. the Saginaw Intervenors contend that the Licensing Board "unlawfully" restricted inquiry (by denying the issuance of subpoenas) on the designs of vendors in competition with Babcock & Wilcox, Inc., the vendor of the reactor in this proceeding. They urge that the Commission is ignoring its health and safety responsibilities by (1) granting proprietary protection to certain information furnished by the applicant and vendor, and (2) "refusing to make comparisons between competing nuclear safety systems." They specifically cite the Board's refusal to issue subpoenas for certain Westinghouse information regarding reagent spray systems, and our affirmance of that ruling in ALAB-35.[35]

The views which we expressed in ALAB-35 are dispositive of the issues raised in this exception, and we find nothing in this exception or in the record of this proceeding which would cause us to modify those views. Exception II. L. is accordingly denied.

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[34] *Id.*, at p. 4, fn. 5.

[35] ALAB-35, WASH-1218 241 (Sept. 21, 1971).

3. In exception II. D., the Saginaw Intervenors assert that the Licensing Board denied them due process by restricting their right of cross-examination. They contend that the Board "in effect" adopted a "rule" that had been suggested by the applicant, which precluded the intervenors from conducting cross-examination "unless they make a *prima facie* showing and were prepared to submit direct evidence" on the invalidity of the information to which cross-examination was directed.[36] Intervenors claim that they were thereby deprived of rights guaranteed them by the Administrative Procedure Act and the Commission's Rules of Practice.

The Board adopted no such "rule." Rather it stated:

> The Board has rejected [applicant's counsel's] request to permit no cross-examination until an affirmative case is established on particular points, and the Board was continue to reject [applicant's counsel's] argument if it is advanced. It seems to us better to take each issue as it comes up and to decide in connection with each issue whether it is one in which we think the process can be fruitful.[37]

On this basis, the Licensing Board permitted extensive cross-examination on the 50% halogen release assumption (from TID-14844) used by the staff, to which exception II. D. is addressed. Only when the Board found that no further repetitive cross-examination would be useful did it limit it by requiring some affirmative showing as a basis for the continuation of such cross-examination.

While opportunity for reasonable cross-examination is provided by the Administrative Procedure Act and the Commission's Rules of Practice, there is no right to un-

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[36] Saginaw Intervenors' Exceptions, p. 17.

[37] Tr. 1894.

limited cross-examination. A party is only entitled to conduct "such cross-examination as may be required for a full and true disclosure of the facts."[38] And presiding officers or licensing boards are specifically authorized to "regulate the course of the hearing."[39] As is made clear by the legislative history of the Administrative Procedure Act, presiding officers are called upon

> to make the necessary initial determination whether the cross-examination is pressed to unreasonable lengths by a party or whether it is required for the "full and true disclosure of the facts * * *".[40]

The Licensing Board made that determination with respect, *inter alia*, to the cross-examination on the 50% halogen release assumption. In our opinion, it did not abuse its discretion in that regard. Exception II. D. is accordingly denied.

4. Equally without merit are several exceptions contending in essence that the Licensing Board improperly placed the burden of proof on the intervenors to show the plant should not be built.

a. In exception II. E. the Saginaw Intervenors recite the applicable regulations which require a license applicant to assume the burden of proof to establish his entitlement to a license.[41] The intervenors then refer to the matter of the alleged limitation on cross-examination with which we have just dealt, as well as to several statements of the Licensing

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[38] 5 U.S.C. 556(d); 10 CFR § 2.743(a).

[39] 5 U.S.C. 556(c)(5); 10 CFR § 2.718(e). See *International Harvester Co.* v. *Ruckelshaus*, —F. 2d—, slip opinion p. 22 (D. C. Cir. February 10, 1973).

[40] Administrative Procedure Act—Legislative History, S. Doc. 248, 79th Cong., 2d Sess., at p. 271.

[41] 10 CFR § 10.732.

Board which purportedly reflect a "shift [of] the initial burden of challenge to Intervenors."[42]

Specifically, intervenors quote Dr. Hall as stating that they "have to convince" the Board that "it [the reactor] is improper."[43] But they fail to perceive that, in context, Dr. Hall was merely stating the obvious proposition that each party to the proceeding had the responsibility, if it were to prevail, of convincing the Board of the merit of its contentions.

Similarly, the intervenors refer to what they characterize as a Board "ruling * * * that the Regulatory Staff's submissions are *prima facie* reasonable unless rebutted by intervenors."[44] However, the Board's statement was made in the course of a discussion of whether, and with what quantum of proof, an intervenor could "challenge the whole development of AEC regulations and standards as applied to reactors * * * assumptions which were adopted in 1962 and have been under process of evolution in the period since then."[45] In this limited context, the statement was proper.

The exception is denied.

b. The Saginaw Intervenors also allege an improper shift in the burden of proof in the Board's consideration of environmental issues. Their exception IV. E. states that the Board applied an erroneous burden of proof in assuming that, once a need for electricity has been established, NEPA requires a showing of overriding special environmental damage to offset such need. They assert that the

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[42] Saginaw Intervenors' Exceptions, p. 19.

[43] Tr. 1048.

[44] Saginaw Intervenors' Exceptions, p. 20. The Board's statement in question appears at Tr. 1893.

[45] Tr. 1890, 1891.

Licensing Board adopted the applicant's conclusions that there was a need for power, "without analyzing the purposes for [which] such assumed electricity would be used;" and, then, required a special showing of environmental damage to outweigh the benefits to be derived from meeting such need. As a result, they contend, the Board engaged in an unlawful weighing of factors in favor of the development of nuclear energy.

To support this exception, the intervenors quote three sentences from the initial decision. But the sentences are taken out of context and, in our opinion, do not support the proposition for which they are cited.

In its environmental review and balancing, the Board identified and discussed both benefits and costs and finally concluded that the "benefits outweigh the costs." It was in this context of its discussion of the extensive evidence on this record purporting to establish a need for the facility that the Board made its statement that "special environmental damage" must be shown to outweigh the evidence of need shown on this particular record. Similarly, the Board's statement that there is no way in which the loss of flora and fauna "in a site of this kind" can outweigh the benefits of supplying the need was the result of its balance of the loss of flora and fauna from a vacant lot in an industrial area against the benefits of meeting the need for electricity, as indicated by evidence of record.

Finally, the Board's statement that a judgment has been made in the Atomic Energy Act that atomic energy "must" be used for production of electricity was made in the context of a discussion evaluating the environmental effects of low-level radioactive discharges, and the claim that plants should not be licensed until all of those effects are ascertained. In that context, we believe that the statement should be interpreted to mean that the Commission must exercise its licensing authority if all applicable requirements which are prerequisites to the exercise of that au-

thority (environmental as well as radiological) have been satisfied.[46]

In context, there is nothing in these statements which represents a lack of regard for environmental values. Indeed, they represent only one aspect of the Board's evaluation and balancing of environmental considerations. To be sure, the intervenors may question the balance reached by the Board, but we see nothing to indicate that the Board applied an incorrect burden of proof as to environmental issues. And as will be seen later, the Board correctly declined to evaluate the particular uses that would be made of the electricity produced, although it did find that the postulated demand would be made up of normal industrial and residential use.[47] Accordingly, exception IV.E. is denied.[48]

V. ECCS Issues

The exceptions of both the Saginaw and Mapleton Intervenors raise questions concerning the reactor emergency core cooling system (ECCS). In general, these exceptions fall into two general types: those challenging the validity of the Commission's ECCS Criteria,[49] and those challenging the conformance of the Midland ECCS to those Criteria.[50]

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[46] Viewed in this manner, the statement negates the contentions made in Saginaw Intervenors' exception VI. C.

[47] See Part XI. 3.a of this decision, *infra*. p. 351. [P. 236 this appendix.]

[48] The burden-of-proof question has also been raised in Exception III. E, as part of a discussion of the Board's handling of the synergism issue. We will deal with all aspects of the synergism issue in Part VIII of this decision, *infra*, pp. 344-345. [Pp. 216-220 this appendix.]

[49] Saginaw Intervenors' exceptions II. J. and III. A., and Mapleton Intervenors' exception 4.

[50] Saginaw Intervenors' exception III. B.

We have already held that a licensing board may not entertain an attack upon the Interim Acceptance Criteria. The only question that may be litigated in an individual licensing proceeding is whether the ECCS of the reactor in issue conforms to those Criteria.[51]

As for the conformance of the Midland ECCS to the Interim Criteria, the Saginaw Intervenors, in exception III. B., contend that the applicant "has not submitted evidence in order to meet Criteria Nos. 3 and 4 of the Interim Acceptance Criteria." They reason that our prior ruling in ALAB-46, *supra,* requires only that an applicant demonstrate conformance to the appropriate evaluation model; that this ruling is in error; and that a computation pursuant to the evaluation models does not necessarily demonstrate compliance with these Criteria.

Since, as the Licensing Board explicitly found, the intervenors did not contest below the compliance of the proposed reactor with the Interim Criteria,[52] there is no necessity for us to entertain these assertion. In any event, we note that the identical assertions were recently made and rejected by us in the *Indian Point 2* proceeding.[53] We adhere to the reasons there assigned for that rejection.

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[51] *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-57, WASH-1218 435 (June 20, 1972); *Wisconsin Electric Power Co., et al.* (Point Beach Nuclear Plant, Unit 2), ALAB-78, WASH-1218 (Suppl. 1) 517, 523-24 (November 10, 1972); *Boston Edison Co.* (Pilgrim Nuclear Power Station), ALAB-83, WASH-1218 (Suppl. 1) 552 (December 4, 1972). See also *Consolidated Edison Co.* (Indian Point Unit No. 2), ALAB-46, WASH-1218 293 (March 10, 1972); *Baltimore Gas & Electric Co.,* Docket Nos. 50-317 and 50-318, Commission Memorandum and Order dated September 13, 1972, at p. 3.

[52] Initial Decision, par. 40.

[53] *Consolidated Edison Co.* (Indian Point Unit No. 2), ALAB-95, RAI-73-1 33 (January 18, 1973).

VI. Limitation of Intervenors' Discovery

Certain of the exceptions filed by both groups of intervenors challenge the extent of discovery which the intervenors were accorded under various rulings of the Licensing Board and, on one occasion, by one of our decisions.[54]

1. Exception II. A. of the Saginaw Intervenors questions the Licensing Board's rulings disallowing certain interrogatories addressed by the intervenors to the staff and the Commission's Advisory Committee on Reactor Safeguards (ACRS). Exception II. N. has a somewhat similar thrust, questioning the rulings of the Licensing Board as well as our own ruling (ALAB-33)[55] disallowing certain of the intervenors' document requests. Since both of these exceptions bear to some extent upon the appropriate role of the ACRS in a proceeding such as this, we will also take this opportunity to consider two other exceptions (II. H. and I.) pertaining to the reports of the ACRS on the Midland reactors.

a. Section 182b of the Atomic Energy Act, 42 U.S.C. 2232(b), directs the ACRS to review each construction permit or operating license application, and to submit a report thereon "which shall be made part of the record of the application and available to the public" (with limited exceptions not here relevant). The ACRS letter is only admitted as part of the record to show compliance with statutory requirements and not for the truth of any of the statements therein.[56] However, the AEC Rules of Practice

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[54] The alleged limitations which we here discuss are those occasioned by the nature of the information requested or the identity of the person or persons from whom such information was sought, and do not include those arising as a result of the exclusion of issues which the intervenors sought to inject into this proceeding. For a discussion of some of these issues, see Parts IV and V of this decision, *supra.*

[55] ALAB-33, WASH-1218 225 (September 3, 1971).

[56] *Wisconsin Electric Power Co.* (Point Beach Nuclear Plant,

provide that in uncontested cases, and in contested cases with respect to issues which are not controverted by any party a licensing board may rely on the "conclusions of the ACRS."[57]

b. In exception II. A. the Saginaw Intervenors claim they were denied "due process" by the failure of the Licensing Board to require the Regulatory Staff or the ACRS to answer interrogatories directed to both radiological and environmental issues.

The Licensing Board in fact directed the staff to answer many interrogatories but sustained objections to others, principally on the ground of undue burden.[58] The Board also noted that many of the interrogatoies directed at the staff were not propounded to seek facts but, rather, to inquire into the thought processes of the staff and its rationale for reaching certain decisions. Thus, the Board stated:

> It is perhaps not an exaggeration to say that complete answers to these interrogatories would require the staff to prepare a justification, intelligible to laymen, of the whole history of the development of pressurized water reactors * * * [59]

Moreover, in rejecting interrogatories on environmental matters, the Board took into account that many of those

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Unit 2), ALAB-78, WASH-1218 (Suppl. 1) 517, 527 (November 10, 1972); *Arkansas Power and Light Co.* (Arkansas Nuclear One, Unit 2), ALAB-94, RAI-73-1 25 (January 18, 1973).

[57] 10 CFR Part 2, Appendix A, III(g) (regulations in effect prior to August 28, 1972); similar requirements now appear in Part 2, Appendix A, V(f)(1) and (2).

[58] ASLB telegrams of May 13 and May 27, 1971, and "Rulings on Interrogatories Addressed to the AEC Staff," dated June 1, 1971. See also Tr. 1879.

[59] June 1, 1971 "Rulings," at pp. 2-3.

interrogatories were simply resubmissions of interrogatories previously disallowed, and that the intervenors had failed to show why the earlier rulings no longer prevailed.[60]

Under 10 CFR § 2.718, the Board has broad discretionary authority to confine discovery within reasonable limits. Absent an abuse of discretion affecting substantial rights of a party, a board's rulings will not be disturbed.[61] We find no such abuse of discretion here.

c. The major emphasis in exception II. A. is upon the Licensing Board's denial of all interrogatories directed to the ACRS. We have previously stressed, in holding that an ACRS report could not be admitted into evidence for the truth of the matters stated therein, that the "persons responsible for the report (the members of the ACRS) are not subject to being examined by the parties or the Board" with reference to the contents of the report.[62] That being so, the denial of all of the intervenors' interrogatories directed to the ACRS was plainly correct.[63]

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[60] "Order With Respect to Various Motions Filed in this Proceeding," dated December 22, 1971, p. 16.

[61] *Cf. Bell* v. *Swift & Co.*, 283 F. 2d 407, 409 (5th Cir. 1960).

[62] *Arkansas Power and Light Co.* (Arkansas Nuclear One Unit 2), ALAB-94, *supra*, at p. 32, citing a Commission order of January 26, 1972 in the ECCS rulemaking proceeding, Docket No. RM-50-1.

[63] Exception II. H. of the Saginaw Intervenors represents another view of the same issue. It challenges the admission into evidence of the report and letter of the ACRS without according the intervenors an opportunity to question the truth, validity or authenticity of the statements made therein. Since the documents were not admitted for the truth of the matters stated therein but "for the sole purpose of showing compliance with the statute" (Initial Decision, par. 1, fn. 2; Tr. 1881-2, 1895), the manner in which the ACRS arrived at the views which it expressed is irrelevant here. Discovery thereon is not required. Moreover, the instances which intervenors cite as showing substantive reliance by the Licensing Board on ACRS statements are misplaced; they either do not mention or

2. Exception II. N. raises a similar question regarding the propriety of the Licensing Board's denial of document discovery against the ACRS. For reasons indicated above, such discovery is not available under existing Commission procedures. The Licensing Board committed no error.

Exception II. N. also objects to our ruling in ALAB-33[64] concerning the discovery of privileged documents. Since no valid reason for us to change that ruling has been set forth, we decline to do so.

VII. Suitability of the Midland Site

Several of the Saginaw Intervenors' exceptions relate to the suitability of the Midland plant site for its intended use, both from a safety and an environmental standpoint. In our opinion, none of these exceptions is meritorious.

1. Exception III. D. asserts that there is no basis in the record for the Licensing Board's finding that the requirements of 10 CFR Part 100 have been satisfied. The intervenors advance two independent bases for this contention.

First, they insist that Part 100 incorporates, as a guide, T.I.D. 14844;[65] that if an applicant does not wish to follow T.I.D. 14844, it must demonstrate the applicability of alternative criteria; and that the applicant and staff, in asserting that the Midland application satisfied the requirements of Part 100, relied on Safety Guide 4 rather than T.I.D.

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concern the ACRS, or reflect the Licensing Board's ruling limiting its reliance upon the ACRS report to establishing that the statutory directions appearing in Section 182b, of the Atomic Energy Act had been satisfied. In our view, the Licensing Board did not assign any independent probative value to any statements in the ACRS report.

[64] ALAB-33, WASH-1218 225 (September 3, 1971).

[65] "Calculation of Distance Factors for Power and Test Reactor Sites," dated March 23, 1962.

14844 without providing an adequate justification. Intervenors add that had T.I.D. 14844 been used, the Midland site would have been found "unacceptable."[66]

Secondly, the intervenors contend that the Licensing Board's judgment as to site acceptability was conditioned on its finding that the emergency plans met the requirements of 10 CFR Part 50, Appendix E; and that the evidence of record provides "no support" for such a finding. Intervenors argue that the Board was required not only to determine that an adequate plan existed but also that it was workable; and that, absent such a determination, the Licensing Board had no basis for concluding that the Midland site was suitable.

a. Turning first to the question of the general criteria which the applicant has utilized to establish its compliance with 10 CFR Part 100 ("Reactor Site Criteria"), the intervenors appear to read Part 100 as a completely frozen statement of exact procedures to be followed for the evaluation of reactor sites. On the theory that the procedural methods and site calculations developed in T.I.D. 14844 have been incorporated by reference into Part 100, they reason that the record must at least adequately demonstrate a valid reason for deviating from those procedures and calculations. Finding such a deviation in the applicant's and staff's admitted reliance on Safety Guide 4—which, among other things, sanctions a Board's consideration for site evaluation purposes of engineered safeguards such as emergency core cooling systems—the intervenors assert that the record fails to demonstrate the reliability of engineered safeguards and hence fails to provide an adequate basis for the Board to rely on Safety Guide 4.

This argument ignores 10 CFR § 100.10, which in describing various factors which the Commission will take into account in evaluating site acceptability, specifically

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[66] Saginaw Intervenors' Exceptions, p. 53-12.

sanctions the consideration of, *inter alia,* "safety features that are to be engineered into the facility." 10 CFR § 100.10(a)(4). It also ignores the actual content of Safety Guide 4. It is true that Part 100 provides (in a footnote) that T.I.D. 14844 *may* be used for guidance and that the calculations in that document *may* be used as a point of departure for consideration of particular site requirements. But the basic requirements of paragraphs 1a, 1b and 1c of Safety Guide 4 (which intervenors claim has been improperly substituted for T.I.D. 14844) are essentially the same as those in T.I.D. 14844. Paragraph I d of Safety Guide 4 merely permits the applicant to take credit for the reduction in the amount of radioactive material available for leakage due to containment sprays, filter systems and other engineered safety features—a provision clearly consistent with 10 CFR § 100.10(a). Paragraph 1e of Safety Guide 4 is slightly different from assumption 4 of T.I.D. 14844, in that the rate of leakage from the containment is reduced after 24 hours because of the decrease in pressure in the containment; but, again, this provision is consistent with 10 CFR § 100.10(a).

Not only is it consistent with Part 100 for a board to take account of engineered safeguards such as an emergency core cooling system, but there is also no requirement that there be a demonstration on the record of the effectiveness of such a system—assuming, of course, that applicable criteria have been established and that the system complies with such criteria. If an ECCS meets such criteria, "the Commission has judged it to be acceptable." [67] The Licensing Board found conformance of the Midland ECCS with applicable criteria,[68] and we have earlier (Part V, *supra*) rejected the Saginaw Intervenors' exception on

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[67] *Consolidated Edison Co.* (Indian Point No. 2), ALAB-46, WASH-1218 293, 302 (March 10, 1972).

[68] Initial Decision, par. 40.

that issue. Accordingly, it was appropriate for the Licensing Board to take into account the emergency core cooling system in its determination that the plant conformed to the requirements of Part 100.

Intervenors also object to what they describe as one of the assumptions of both T.I.D. 14844 and Safety Guide 4—that the fission product release contemplated by those documents is conservative only if the ECCS is "almost or 100% effective." They contend that

> [o]nly pursuant to such an assumption can one say that an abitrary release of fission products less than the total fission inventory of the core is conservative.[69]

This contention derives no support from the record, which clearly shows (Tr. 1867-8) that the amount of radioactive releases from the core used in T.I.D. 14844 calculations assumes essentially 100% meltdown of the core. It is only under conditions of complete failure of the ECCS that such a complete meltdown might possibly occur. The fission-release values are therefore conservative even under partial operation of the ECCS. While the intervenors disagree with this, they did not produce any contrary evidence in spite of an invitation by the Board for them to do so. (Tr. 1890-93). Accordingly, we find no reason to find fault with the Board's utilization of the guidelines of Safety Guide 4 in its determination regarding conformance to Part 100, or to upset its findings regarding site suitability under Part 100 which are premised upon the criteria of Safety Guide 4.[70]

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[69] Saginaw Intervenors' Exceptions, p. 53-15.

[70] Intervenors further claim in this regard that the Licensing Board was uninterested in the whole concept of the safety of the people in the Midland community. Neither the pages of the transcript quoted by the intervenors (Tr. 1679-1887 and Tr. 1610-1667) nor any other part of the record discloses any indication of any such disinterest by the Board.

b. The second aspect of intervenors' challenge to the Part 100 findings evolves from the Board's acceptance of the applicant's proposed emergency evacuation plan. The Board considered the evaluation plan not only from the standpoint of whether it satisfied the requirements of 10 CFR Part 10, Appendix E ("Emergency Plans for Production and Utilization Facilities") but also as an element in satisfying the requirements of Part 100. Thus, it found that the residential population within the low population zone is "well within acceptable limits," as defined by Part 100; but that the transient population within such zone—primarily employees of Dow—is "unusually large" and acceptable under Part 100 only on the assumption of an effective evacuation plan.[71]

With respect to the plan itself, the Licensing Board noted that it had given particular consideration to the evacuation procedures of Dow. The Board had found a plan which had been initially proposed, and which had been developed prior to the promulgation of Appendix E to be "inadequate," and had required the applicant to submit a revised plan. The Board ruled that the revised plan conforms to the requirements of Appendix E.[72]

In making its determination regarding conformance of the plan with both Appendix E and Part 100, the Licensing Board interpreted the regulations as requiring only a discussion of preliminary plans "sufficient * * * to assure the compatibility of proposed emergency plans" with the plant location, and not "specific proposals."[73] Specifically discounting the testimony of a witness of Saginaw Intervenors, the Board found that "timely evacuation is reasonably assured."[74]

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[71] Initial Decision, par. 16.

[72] *Id.*, par. 33.

[73] *Id.*, par. 32.

[74] *Id.*, par. 33.

The Saginaw Intervenors question the legal test adopted by the Licensing Board in this regard; they claim that the Board was required to investigate and make findings regarding the workability of the plan. Their argument is somewhat analogous to that which they made—and which we accepted—with regard to the quality assurance (QA) plan under consideration in this proceeding. See ALAB-106.[75] But QA plans and emergency evacuation plans are not at all comparable and the respective regulatory requirements differ substantially. We held in ALAB-106 that at least in certain situations a licensing board at the construction permit stage must look into the workability of QA plans; those plans are used during the plant's construction and are a vital component of the Commission's safety program applicable to such construction. In contrast, emergency evacuation plans play no such role during construction, and the requirements of Appendix E recognize that fact.[76]

In their challenge to the Board's findings concerning the emergency plan, the intervenors cite both Sections II and IV of Appendix E as the sources of the rules applicable in this proceeding. Our review of the initial decision convinces us that the Board correctly applied the criteria of Section II, which govern plans at the construction permit stage; and that it was not required to apply the criteria of Section IV, which deal with the content of plans to be submitted at the operating-license stage in the Final Safety Analysis Report.

Intervenors also claim that the Board erroneously disregarded testimony of the witness that it was impossible to evacuate either the low population zone or the City of Midland in the time required by the regulations. The regulations required a showing of the possibility of evacuation

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[75] RAI-73-3 182 (March 26, 1973).

[76] 10 CFR Part 50, Appendix E, Sections II, III and IV.

only from the low population zone,"[77] and only one outlying area of the City of Midland (primarily occupied by Dow) falls within that zone. There is ample evidence of record which indicates that evacuation of the low population zone within the requisite time period is feasible."[78] Accordingly, there was warrant for the Board's findings on this subject.

2. Mapleton Intervenors' exception 2 is directed to the Board's finding that the residential population in the low population zone is "within acceptable limits."[79] These intervenors claim that this finding was made without any reference either to the criteria aplied to determine what limits are acceptable, or to the justification for those criteria.

We note first that Mapleton Intervenors failed to raise below an issue concerning the residential population of the low population zone and hence should not be permitted to raise it before us. On the merits, however, it is obvious from the initial decision that the Licensing Board, as it was required to do, evaluated the residential population of the low population zone in accordance with the criteria in 10 CFR § 100.3(b). Moreover, the record adequately supports the acceptability of the low population zone.[80] This exception is denied.

3. Saginaw Intervenors' contention IV.J. asserts that, in the environmental phase of the initial decision, the

[77] 10 CFR § 100.3.

[78] See, e.g., Tr. 2604-15, 2664-83, 3096-3266, 3282, 3286-7, 3397-3400. Intervenors assert that their witness testified that it would take "at least four hours to evacuate Dow." Exceptions p. 53-19. In fact, their witness testified not that it would take "at least four hours" to evacuate Dow but, rather, that he estimated "that it would take two-and-a-half to four hours." (Tr. 4775).

[79] Initial Decision, par. 16. See further discussion *supra*, p. 342. [P. 212 this appendix.]

[80] See, *e.g.*, Tr. 1674, 3295, 3339-40, 3371-72, 3398-3400.

Board should have analyzed the adequacy of Part 100 and of Appendix E to Part 50. The intervenors base this contention on the "peculiar circumstances of the site" which, they contend, require an analysis from an environmental standpoint of whether "mere compliance with those regulations was sufficient."[81]

The Board applied the criteria of Part 100 and of Appendix E only in the context of its health and safety responsibilities. It independently evaluated the environmental aspects of the plant, taking into account the particular site characteristics, as well as applicable Commission guidelines. Thus, various accidents were individually analyzed, in the manner outlined in the September 1, 1971 letter of the AEC Director of Regulation to applicants,[82] and the potential releases of such accidents and the probabilities of their occurrence evaluated in making a judgment as to their environmental effect.[83]

Intervenors specifically refer to the lack of cost-benefit analysis of an individual's exposure to a 300 rem dose to the thyroid, as the result of an accident. Footnote 2 to 10 CFR 100.11, which is addressed to the 25 rem whole-body dose to a person situated at the boundary of the *exclusion* area, expressly states that "[h]owever neither [the use of the 25 rem] value nor that of the 300 rem value for thyroid exposure as set forth in these site criteria guides are intended to imply that these numbers constitute acceptable limits for emergency doses to the public under accident conditions." We emphasize again that 10 CFR Part 100 is to be used for the evaluation of proposed sites

[81] Saginaw Intervenors' Exceptions, p. 96a.

[82] "Scope of Applicant's Environmental Reports with Respect to • • • Accidents," dated September 1, 1971. Use of this document has been explicitly sanctioned. See 36 *F.R.* 22851 (December 1, 1971).

[83] Initial Decision, pars. 67, 74.

and not to set individual limits of exposure to radioactivity.

Apart from these considerations, the Board did in fact deal with the environmental aspects of the hypothetical accidents contemplated by Part 100, finding the possibility of such an accident to be "vanishingly small" and "their environmental risk • • • extremely low." [84]

Accordingly, this exception is without merit.[85]

VIII. Synergism

One of the major contested issues in this proceeding is the claimed "synergistic" interaction of releases of radioactivity with chemicals released from the Dow plant. The Saginaw and Mapleton intervenors each asserted, with respect both to the radiological and environmental aspects of the proceeding, that the combination of radioactive and chemical effluents would produce a synergistic effect which is greater than the sum of the separate effects. The Saginaw Intervenors through discovery obtained from Dow a list of effluents expected to be discharged from the Dow facility in 1975, the year the Midland plant was originally scheduled to begin operation.[86] Nevertheless, they produced no evidence in support of their contentions respecting synergism. The Mapleton Intervenors, however, presented three witnesses on this subject.

[84] Initial Decision, pars. 67, 74.

[85] Saginaw Intervenors' Exception IV.F. makes a somewhat similar contention applicable to safety regulations generally, asserting that the Board relied on such regulations but failed to undertake a cost-benefit analysis for each one of them. As in the case of Part 100 and of Part 50, Appendix E, which we have heretofore discussed, the Board applied various safety criteria only in the context of its health and safety responsibilities. It independently evaluated the environmental aspects of the plant, taking into account its predicted environmental effect. For example, with respect to permissible radiation releases (to which intervenors specifically refer), the Board analyzed the environmental impact of releases, on the assumption that they will meet the "as low as practicable" criteria which will be set up by Part 50, Appendix I, when it is finally approved. Such review conforms to the mandates of NEPA. Exception IV. F. must also, therefore, be denied.

The Licensing Board found that, standing alone, the intervenors' evidence failed to establish "that, at the levels of concentration involved here, there will be any interaction which would tend to increase radiation effects from the Plant, or the chemical effects from Dow." [87] Considered in light of the evidence presented by the applicant and staff, the Board found the evidence against a finding of "synergism" to be "overwhelming."

a. In exception III. E., the Saginaw Intervenors begin their discussion of the synergism issue by stating that this issue was considered only as a result of the effort of the intervenors; but that despite those efforts, the Licensing Board failed to treat it adequately. They concede that the Board started an inquiry on synergism but claim that it "never really followed through." [88]

The record does not support this claim. The technical members of the Board, in particular, on several occasions directed a number of penetrating questions respecting synergism to the staff (*e.g.*, Tr. 7557), the applicant (*e.g.*, Tr. 8905) and the intervenors (*e.g.*, Tr. 8266-267, 8469, 8514-15). In this regard, the Board adequately carried out a licensing board's responsibilities. See pp. 12—17, *supra*.

b. The apparent thrust of exception III.E. is that the evidence (presented by the Mapleton Intervenors) on synergism was sufficient to constitute a *prima facie* showing

[86] Initial Decision, par. 65.

[87] Initial Decision, par. 66.

[88] Saginaw Intervenors' Exceptions, p. 53-22.

of the "invalidity" of the standards imposed by Parts 20 and 100 of the Commission's regulations. Accordingly, so the intervenors argue, the Licensing Board should have certified the question of the validity of these regulations to this Board or, at least, "'sufficiently analyzed its implications.'"[89]

Certification to us would have been required, under procedures then in effect, only if the Licensing Board concluded that "there is a substantial question presented on the record as to the validity of a challenged regulation."[90] From our review of the initial decision, we perceive no such conclusion on the part of the Licensing Board, particularly as applied to the evidence on synergism. To the contrary, the Board specifically found the intervenors' evidence to be nonpersuasive. We see no reason to upset that finding.

c. The final point on synergism made by the Saginaw Intervenors is that the burden of proof on this issue was "misplaced;" and that the Board required the intervenors to "demonstrate there was a problem of synergism rather than, as is required by the Rules, having Applicant and the Regulatory Staff demonstrate that there is no problem with synergism."[91] Here intervenors misinterpret the requirements of the rules.

The ultimate burden of proof on the question of whether the permit or license should be issued is, of course, upon the applicant. But where, as here, one of the other parties contends that, for a specific reason (in this instance alleged synergism) the permit or license should be denied, that

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[89] *Id.*, p. 53-23.

[90] *In the Matter of Baltimore Gas and Electric Co.* (Calvert Cliffs Nuclear Power Plant, Units 1 and 2), Docket Nos. 50-317, 50-318, Commission Memorandum dated August 8, 1969, at p. 4.

[91] Saginaw Intervenors' Exceptions, p. 53-23.

party has the *burden of going forward* with evidence to buttress that contention. Once he has introduced sufficient evidence to establish a *prima facie* case, the burden then shifts to the applicant who, as part of his overall burden of proof, must provide a sufficient rebuttal to satisfy the Board that it should reject the contention as a basis for denial of the permit or license. In this case, the Licensing Board determined not only that the intervenors had failed to make a *prima facie* showing of synergistic effects, but also that the applicant's evidence affirmatively established that synergism would not occur.

d. It is unfortunate that, in connection with an issue as contested and as novel as the synergism issue, the Licensing Board's ruling was as cursory as that appearing in paragraphs 64-66 of the initial decision. While the Board did state that, when one considers the testimony of the applicant and staff, the evidence against a finding of "synergism" was "overwhelming," the decision deals specifically only with the inadequacies of the intervenors' testimony. It neglects to include any specific reference to the persuasive evidence on synergism presented by the applicant and staff. The applicant presented three witnesses on this subject (Drs. John H. Rust, Merrill Eisenbud, and G. Hoyt Whipple), including an extensive paper by Dr. Rust (Tr. 8873-8900). The staff presented testimony by Dr. Norman A. Frigerio. These witnesses were subjected to extensive cross-examination (Tr. 8909-8944).

The testimony of these witnesses can perhaps best be summarized in the words of Dr. Rust:

> • • • there is no direct or indirect evidence that will lead to the conclusion that the effluent of either the Dow plant or the Midland nuclear power station will interact in any way to make the very minimal ionizing radiation released or the minimal chemical effluents

expected harmful to man, his ecosystem or the biosphere in general, now or in the future.[92]

The conclusion was reached after an extensive analysis of the characteristics and effects of the various effluent releases, and with regard both to somatic effect and genetic damage.

We regard the views expressed by the staff's and applicant's witness as dispositive on the synergism question, and adequate to support the Licensing Board's ultimate findings on this issue. Saginaw Intervenors' exception III. E. is accordingly denied.

e. The Mapleton Intervenors' questioning of the Board's findings regarding synergism is disposed of by our comments in d., *supra*. With respect to those intervenors' challenge to certain exclusionary evidentiary rulings, only that relating to the affidavit of Dr. Charles Huver is sufficiently identified to be considered. Dr. Huver's affidavit was viewed as a challenge to Part 20 and was excluded on the ground that it did not raise a substantial question as to the validity of Part 20.[93] Dr. Huver was not called upon to testify on synergism, and he was not made available for cross-examination. His affidavit was accordingly not entitled to any evidentiary weight. Mapleton Intervenors' exception 9 is accordingly denied.

IX. Analysis of Hypothetical or Design Basis Accidents

The analysis of hypothetical or design basis accidents is an essential part of the Commission's licensing review procedures, both from a safety and an environmental standpoint. Questions in both areas hase been raised in this pro-

[92] Tr. 8896.

[93] Licensing Board's Order dated March 10, 1972.

ceeding. We will first address the safety questions on this subject, and thereafter the environmental questions.

1. In exception III. C. the Saginaw Intervenors contend that the Licensing Board failed to analyze all of the required accidents associated with design and operation of the proposed plant. They claim that the loss-of-coolant accident (LOCA) analyzed by the applicant and staff, and accepted by the Board, is not the "true credible accident," since the analysis was premised "on the effectiveness of engineered safeguards such as emergency core cooling system as well as upon the integrity of the pressure vessel of the primary coolant system."[94] They read such analysis as being inconsistent with the definition of LOCA.[95]

Intervenors misstate the analysis actually undertaken by the applicant and staff. Rather than assuming operation of the ECCS to prevent core meltdown, as intervenors claim, the hypothetical accident analyzed by both the applicant and staff assumed, in accordance with 10 CFR § 100.11(a), footnote 1, a substantial meltdown of the core with subsequent release of appreciable quantities of fission products.[96] The safety analysis assumed that only one-half of the engineered safeguards are available during the accident.[97]

Exception III. C. includes a further claim that accidents occurring in two other circumstances should have been analyzed; a simultaneous maximum hypothetical accident in both Midland reactors, and a maximum hypothetical accident at one reactor together with the largest credible

[94] Saginaw Intervenors' Exceptions, p. 53-7. The pressure vessel integrity issue was also raised in Exception II. B. and has been disposed of in our discussion of that exception (*supra*, pp. 336-337).

[95] 10 CFR Part 50, Appendix A.

[96] Tr. 1946-50, 1867-8.

[97] Tr. 2320.

chemical incident at the Dow facilities. We assume that the intervenors are referring to simultaneous postulated accidents chosen for 10 CFR Part 100 evaluation purposes. Section 100.11(b) provides that site criteria need only be analyzed with respect to a single accident unless an accident in one reactor would initiate an accident in another, or unless an accident in one reactor could affect the safety of the operation of the other reactor. The Midland reactors are not to be interconnected and there is no showing on the record of this proceeding that an accident in one unit would initiate an accident in the other. Similarly, there has been shown no cause and effect relationship between an accident at Midland and one at Dow. In those circumstances, the simultaneous accidents mentioned by the Saginaw Intervenors need not have been considered by the Licensing Board.[98]

Exception III. C. is accordingly denied in its entirety.

2. Saginaw Intervenors' exception V. A. deals with design basis accidents from the point of review of the Commission's environmental responsibilities. In that respect, the regulations in Appendix D to 10 CFR Part 50 (implementing the requirements of NEPA) have been construed to require, at least since their major restructuring in September, 1971, a discussion in environmental impact statements (and concomitantly consideration at any public hearing) of the environmental impact of certain types of nuclear accidents. By letter dated September 1, 1971,[99] the AEC Director of Regulation issued instructions to all license applicants relative to the manner in which accidents were to be discussed in environmental reports. Nine categories of postulated accidents were established, rang-

[98] See also *Wisconsin Electric Power Co.* (Point Beach, Unit 2), ALAB-31, WASH-1218 201 (August 18, 1971).

[99] "Scope of Applicant's Environmental Reports with Respect to • • • Accidents," *supra.*

ing from the most trivial to the most severe. Class 1 accidents do not have to be considered "because of their trivial consequences." At the other extreme, Class 9 accidents also do not have to be considered; while it was recognized that their consequences "could be severe," it was also concluded that "the probability of their occurrence is so small [as a result of such factors as defense in depth (multiple physical barriers), quality assurance, continued surveillance and testing, and conservative design] that their environmental risk is extremely low." Class 8 accidents are equated with the design basis accidents used in Safety Analysis Reports and Safety Evaluations, but the analysis of their consequences was directed to be on the basis of realistic assumptions rather than the highly conservative assumptions appearing in the safety reports and safety evaluations.

The instructions to applicants in the September 1, 1971 letter concerning consideration of accidents were incorporated into proposed regulations in December, 1971.[100] These regulations require environmental reports to include a discussion of accidents, based on the assumption set forth in an annex to Appendix D which, like the September letter and for the same reasons, requires consideration of all accidents other than those in Class 1 and Class 9. The proposed regulations are entitled to be accorded some weight, in view of an expression in the Statement of Considerations of the Commission's expectation

> that the provisions of the proposed amendments will be useful as interim guidance until such time as the Commission takes further action on them.[101]

[100] 36 *F.R.* 22851 (December 1, 1971). In footnote 2 of the proposed annex, the September letter was recognized as "guidance" on this subject which had been made available to the public.

[101] 36 *F.R.* at p. 22851 (December 1, 1971). In August, 1972, after the close of the environmental hearings in this case, the Com-

The proposed annex to Appendix D, although it does not require consideration of Class 1 or Class 9 accidents, does recognize that "other accident assumptions may be more suitable for individual cases." Accordingly it specifies that

> [w]here assumptions are not specified, or where those specified are deemed unsuitable, assumptions as realistic as the state of knowledge permits shall be used, taking into account the specific design and operational characteristics of the plant under consideration.[102]

In similar fashion, with respect to Class 8 accidents, the proposed regulations provide that environmental reports need not take into account those accidents

> for which the applicant can demonstrate that the probability has been reduced and thereby the calculated risk to the environment made equivalent to that which might be hypothesized for a Class 9 event.[103]

3. In exception V. A. the Saginaw Intervenors challenge the Licensing Board's disposition of questions raised concerning a Class 9 accident. The Board indicated that the applicant had furnished information with respect to potential public exposures to radioactivity from postulated accidents; and that the information had been furnished in accordance with the guidance in the September 1, 1971 letter of the Director of Regulation (which, as we have seen, was substantively incorporated into the December 1,

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mission issued for comment a draft "Guide to the Preparation of Environmental Reports for Nuclear Power Plants" which, with respect to accidents, incorporated the text of the December 1, 1971 proposals. In March, 1973, following the initial decision here, this guide was issued in final form, incorporating the same guidance with respect to accidents (38 *F.R.* 8013, March 27, 1973.)

[102] *Id.*, at p. 22852.

[103] *Ibid.*

1971 proposed regulations). The Board found, for purposes of the cost-benefit analysis of an individual reactor, that the chances of a serious accident were "vanishingly small," incalculably small," and thus "insubstantial."[104]

This finding—and the related finding in paragraph 67 of the initial decision—are amply supported by evidence of record.[105] In contending otherwise, the intervenors rely on material not part of the record—indeed, material which did not come into being until after the close of hearings in this proceeding. We can, of course, take official notice of new information, and can order a remand to the Board for the consideration of such information if that course of action were necessary or desirable. But a remand is not necessary here because intervenors have misinterpreted the cited portions of the newly discovered information.

They state that "[f]irst of all, the Atomic Energy Commission has recently retreated from its specious argument that the probability of a Class 9 accident is vanishingly small."[106] We know of no such "retreat" and intervenors give no reference to support their statement.

Intervenors further state that " * * * in the Regulatory Staff's NEPA Statement under date of December 8, 1972, and in connection with the ECCS hearings, the Regulatory Staff now admits that there is no statistical basis for a position that the probability of a Class 9 accident is 'vanishingly small'."[107] But what the staff actually said in the December 8 document was quite different (p. 8):

> The conclusions that accidents in this category are sufficiently low in probability that their impact on the

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[104] Initial Decision, par. 74.

[105] See, *e.g.*, Staff Exh. 6, p. VI-3.

[106] Saginaw Intervenors' Exceptions, p. 100.

[107] *Id.*, pp. 100-101.

environment need not be considered is based on the technical judgment of the AEC staff rather than on statistical methods.

Finally, intervenors quote Safety Report WASH-1250 at page 6-39 [108] as stating "that the probability of a Class 9 accident is ten to the minus three, per year." The actual figure on page 6-39 of this report shows that the (catastrophic failure) or Class 9 accident has a probability of 10^{-6}/yr.

It is on the basis of these three gross misstatements that intervenors conclude that the Licensing Board should have engaged in an independent evaluation of the consequences of a Class 9 accident and that not to do so "is almost criminal negligence." [109] Further, the misstatements underpin their suggestion that the applicant and staff had an obligation to establish on the record the likelihood of a Class 9 accident in view of their "burden of demonstrating the propriety of the proposed [licensing] action." [110]

The regulatory judgments used in the calculation of Class 9 accidents may be accepted as correct by licensing boards absent an affirmative showing that they are not correct. Here, no such showing has been made. That being so, Saginaw Intervenors' exception V.A. is denied.

X. Resolution of Various Safety Items

Saginaw Intervenors' exception II. F. and G., their Motion to Supplement the Record of March 28, 1973, and Mapleton Intervenors' exception 3, all relate to the resolu-

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[108] Properly identified as "Draft—The Safety of Nuclear Power Reactors (light water cooled) and Related Facilities—WASH-1250." (December, 1972).

[109] Saginaw Intervenors' Exceptions, p. 102.

[110] *Id.*, p. 100.

tion of various safety questions, either generically or with specific reference to this facility. They also concern the function and relationship of various organizational components involved in the licensing review process, such as the regulatory staff, the compliance staff, and the ACRS, as well as the Licensing Board. For these reasons, those exceptions will be considered together.

1. In exception II. F., the Saginaw Intervenors contend that the staff has implicitly amended the position which it took in its safety evaluation and supplemental safety evaluation of the Midland reactors—i.e., that the reactors can be operated without undue risk—by certain letters requiring the applicant to submit additional information and perform certain recalculations. The intervenors urge that the staff was aware of the information giving rise to these letters prior to the initial decision; and that, accordingly, such information should have been brought to the attention of the Licensing Board. The intervenors further assert that, since the information was not brought to their attenion, they were deprived of an opportunity to raise issues suggested by that information; and that, in any case, the Licensing Board had an independent obligation to consider such issues whether or not contested.

Specifically, intervenors refer to six letters and one bulletin written by the staff. Letters 1, 2 and 4 (as designated by intervenors) deal with quality assurance items. Letters 3, 5 and 7 concern problems that have arisen in the industry with respect to other reactors; in some cases they request reviews and calculations on the equipment or design of the Midland reactors to assure that they will not be subject to similar difficulties. In this group, letter 5 concerns a topic which has been of concern for operating reactors for several months, *i.e.*, the fuel densification problem. This problem is, of course, of no immediate concern to the Midland reactors but it is something that must be considered before operation. Item 6 is a bulletin which in-

forms the industry of problems some licensees have had with a certain type of "valve operator." In the Midland situation, this would merely serve as a notice to the designers to check on the reliability of the "valve operators" to be used in these reactors.

All of these items are representative of the normal, routine correspondence which is carried on between the staff and various segments of the reactor industry. As such, they are simply examples of the staff's carrying out ongoing regulatory functions with respect to every reactor, functions it uninterruptedly performs from the inception of the licensing process to the final stages of decommissioning. In these circumstances, they cannot be taken as constituting implicit amendments to the staff's safety evaluation report.

The exception also avers, in essence, that intervnors had recently learned that the staff had determined that the Babcock & Wilcox design as reflected in the Midland reactors is unsafe. No source for that averment is given; and in a written response to questions asked at the oral argument before this Board, intervenors stated that they had relief on information that "came into the possession of Mr. Ford from very reliable sources • • •"[111] We see no reason why such a totally unsupported assertion should be given any credence.

Intervenors further complain that the letters and bulletin had not been forwarded to them. But there is no rule that requires the forwarding of documents of this type to an intervenor. The documents were deposited in the Public Document Room, as required; and they were available to intervenors and anyone else. Indeed, intervenors assert that they became aware of the information in this manner.

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[111] Letter dated March 26, 1973, from Myron M. Cherry to the Chairman of the Appeal Board for this proceeding.

In sum, the failure to send the documents to intervenors invaded none of their substantial rights.

The exception is therefore denied.[112]

2. Saginaw Intervenors' exception II. G. asserts that because of "amendments" to the staff's evaluation, the ACRS review was not in accordance with Section 182.b of the Atomic Energy Act.[113] As an illustration of such an "amendment," they point to the approval by the staff of the Interim Acceptance Criteria for the emergency core cooling for Baccock & Wilcox reactors, including Midland.

We do not agree with this analysis. The ACRS reviewed this reactor and reported twice to the Commission before the radiological phase of the hearing.[114] The ACRS also reviewed the Interim ECCS Criteria which were adopted by the Commission in June 1971. When the criteria were first approved, they did not include models for the Babcock & Wilcox or Combustion Engineering reactors. Following the staff's approval of models for these two vendors in December 1971, the ACRS reviewed the new criteria incorporating these models and approved them for use.[115]

The Babcock & Wilcox model to which the Midland reactors must conform is detailed in Part 4 of the Interim Criteria. It is obvious that, having reviewed the application for the Midland reactors previously, and having approved the Interim Criteria for the ECCS of Babcock and Wilcox reactors, there was no need for further ACRS review of the Midland reactors.

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[112] Our discussion in Part III, *supra*, adequately disposes of the intervenors' assertion concerning the Licensing Board's obligation independently to investigate matters such as these.

[113] 42 U.S.C. 2232(b).

[114] Letters from ACRS to the Chairman of the Commission, dated June 18, 1970 and September 23, 1970.

[115] Letter from ACRS to Chairman of the Commission, dated January 7, 1972.

3. The question of the need for further ACRS review is also raised by the Saginaw Intervenors' Motion of March 28, 1973, to incorporate into the record on appeal an exchange of correspondence between theACRS and the Commission relating to ACRS "generic items." By letter of December 18, 1972, the ACRS transimtted a list of generic concerns which it had identified in earlier letters on individual facilities. The December 18 letter listed 25 of the items as being resolved, with the other 22 items remaining unresolved. In its response of February 5, 1973, the Commission manifested its intent to continue to conduct research in order to resolve the other items on a generic basis. It is to be noted that, in its December 18 letter, the ACRS makes it clear that resolution of an item "indicates that the Committee is satisfied in a generic sense;" and that, for unresolved items, the ACRS "will continue to consider [these] items and their significance to safety on a case-by-case basis until generic resolution is reached."

The Saginaw Intervenors focus on the unresolved generic items and assert, in effect, that they must be resolved prior to issuance of any further construction permits. The intervenors, of course, had every reason to be aware of the unresolved items applicable to the Midland reactors prior to the close of hearings here, since they had been reflected in the ACRS letters. That some of them remain unresolved (in the sense of the ACRS letter of December 18, 1972) is not new information which would justify reopening of the record. The only new information is that 25 of these generic items *have* been resolved.

Additionally, the lack of resolution of certain items on a generic basis does not mean that, as applied to the Midland reactors, the particular items have not been satisfactorily dealt with. Such applicable items have been considered in the review of these reactors by the regulatory staff, the ACRS, and the Licensing Board. Accordingly, the

exchange of correspondence in question raises no question as to the validity of any of the Licensing Board's findings.

4. Mapleton Intervenors' exception 3 focuses on the Licensing Board's finding that site meteorology data were incomplete,[116] claiming that construction permits may not issue prior to the completion of the meteorological data and analysis. AEC regulations provide otherwise, and permit certain information to be developed during plant construction.[117] When further meteorological data are required, the AEC makes conservative assumptions as a basis for reaching initial conclusions. The decision below conforms to that standard.[118]

XI. Alleged Deficiencies in Environmental Review

A number of exceptions of both the Saginaw and Mapleton intervenors challenge the environmental review of the Midland facility, in terms of the adequacy of the environmental impact statement, the Board's review of various environmental issues or contentions, and certain procedural rulings of the Board relating to the environmental aspects of the proceeding. In this portion of the decision, we will treat those exceptions of this type with which we have not heretofore dealt.

1. Saginaw Intervenors' exception IV. B. contends that the cost-benefit review performed for this facilitiy is insufficient, because it did not quantify various costs and benefits involved. The intervenors read NEPA and the

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[116] Initial Decision, par. 23.

[117] 10 CFR § 50.35(a)(2) and (4).

[118] The Board found that the staff's meteorological assumptions "are sufficiently conservative to justify a reasonable expectation that the site is satisfactory" (par. 22). The testimony of intervenors' meteorologist tended to corroborate this finding (Tr. 3406-3687).

Calvert Cliffs' decision [119] as mandating a quantification of "cost and benefits in anticipation of an arithmetic weighing." In this exception, however, the intervenors recognize that "some environmental values (or industrial needs) may not be capable of quantification," and that in those instances NEPA "would permit a qualifying analysis." [120] They nevertheless assert that a Board must at least make an effort to quantify and must set forth reasons for not doing so.

The asserted requirement for quantification of environmental costs and benefits derives from Sections 102(2)(A) and (B) of NEPA, 42 U.S.C. 4332(2)(A) and (B), which direct Federal agencies to:

> (A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making which may have an impact on man's environment; [and]
>
> (B) identify and develop methods and procedures • • • which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations.

Guidelines of the Council on Environmental Quality incorporate but do not expand upon these statutory directions.[121]

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[119] *Calvert Cliffs' Coordinating Committee* v. *AEC, supra.*

[120] Saginaw Intervenors' Exceptions, pp. 61-62 (fn. 18).

[121] 36 *F.R.* 7724 (April 23, 1971). The requirements are described in somewhat greater detail in the CEQ Memorandum for agency and general counsel liaison on NEPA matters, dated May 16, 1972. On May 2, 1973 (38 *F.R.* 10856) the CEQ issued for comment revised proposed guidelines for the preparation of environmental impact statements which also do not impose any inflexible—or indeed any—requirements relative to the quantification of environmental impacts. Among other things, these proposed guidelines make it clear that, in developing impact statements, agencies should concentrate on the "substance of the information conveyed rather than • • • the particular form, or length, or detail of the statement" (38(b)).

The *Calvert Cliffs'* court read the requirements of Sections 102(2)(A) and (B) of NEPA as contemplating a "rather finely tuned and 'systematic' balancing analysis in each instance." [122] It did not require quantification in all instances. And other courts have made it clear that quantification is not an absolute, and that in some situations it is neither possible nor necessary. *City of New York* v. *United States,* 344 F.Supp. 929, 939 (E.D.N.Y. 1972) (three-judge court). In the words of one court:

> The Court is not here stating that an environmental impact statement • • • would be inadequate simply because the defendants and the Council on Environmental Quality had not identified and developed the methods and procedures to quantify such values. The NEPA does not require the impossible.[123]

It is clear in this case that both the staff, in its Final Environmental Statement, and the Board, in its decision, have balanced the costs of the proposed plant against its benefits. In doing so, the Board found that it was "not possible" to quantify all costs and benefits, and to reach an arithmetical balance, since "more often than not the quantifications are so speculative and non-objective as to be worse than useless." [124] The Board then applied its rationale to particular aspects of the environmental re-

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[122] 449 F. 2d at p. 1113.

[123] *EDF* v. *Corps of Engineers,* 325 F. Supp. 749, 758 (E.D. Ark. 1971), affd. —— F. 2d ——, 4 ERC 1721 (8th Cir. 1972).

[124] Initial Decision, par. 45.

view. For example, it found serious difficulties with intervenors' attempts to quantify the value of flora and fauna to be disturbed by construction, concluding that their "method of evaluation and calculation [is] wholly insupportable." [125] But it considered these non-quantifiable factors in reaching its final conclusion that the "benefits outweigh the costs." [126]

Intervenors have pointed to nothing which would indicate that costs which were considered only qualitatively could have been adequately quantified, or which would indicate that the Licensing Board did not take the nonquantifiable factors into account. Accordingly, exception IV.B. is rejected.[127]

2. For the same reasons, Saginaw Intervenors' exception V.H. (as it relates to decomissioning) must also be rejected. That exception finds error in the Licensing Board's failure to quantify the cost and environmental effect of decommissioning of the facility, and the storage of long-lived radioactive waste products.

In paragraph 68 of the initial decision, the Board noted that neither the applicant nor its contractor had any experience with decommissioning, and that the AEC's experience in this regard was not with a plant of the proposed size. It found, however, that decommissioning is possible and that the environmental effects of the most likely method of decommissioning (given today's technology) do not appear substantial, "except for the loss of use of a few acres of land occupied by sealed buildings." It

[125] *Id.*, par. 52.

[126] *Id.*, par. 70.

[127] The intervenors have seemingly abandoned their position advanced before the Licensing Board that it is possible to quantify the effects of the destruction of birds and animals such as sparrows and mice.

also estimated the cost of decommissioning, although it admitted that the estimates were "quite speculative." [128]

There is substantial, uncontroverted evidence of record to support these findings.[129] Moreover, it is clear that they were factored into both the Board's cost-benefit analysis, and its consideration of alternatives. We do not read NEPA or the Commission's regulations as mandating a quantification of an environmental effect which is found to be insubstantial. The Board's qualitative analysis was sufficient.

Intervenors' claim that there must be a quantification of the environmental costs of storage of long-lived radioactive waste products is part and parcel of their assertions relative to the Board's consideration of the environmental effects of the uranium fuel cycle; it will be discussed in the portion of this decision dealing with that subject (*infra*, p. 354). [P. 241 of this appendix.]

3. Saginaw Intervenors' exceptions IV.C., IV.G., V.B., V.C., V.D. and V.E. are somewhat related. They contend, in effect, that the Licensing Board should have considered environmental effects associated with the various uses to which the electricity and process steam produced by the plant will be used. These include the environmental effect of selling or not selling process steam to Dow (IV.C.); the effects of increasing or decreasing industrial use (IV. C); the alternative of not constructing the plant at all (IV.G.); the alternatives of finding other sources of electricity, or embarking on a program to conserve electricity V. B. D.); the environmental propriety of the proposed uses of electricity (V.C.); and the alleged artificial stimulation by advertising of the demand for electricity (V.E.).

[128] Initial Decision, par. 68.

[129] See, *e.g.*, Final Environmental Statement (Staff Exh. 6), p. IX-1; Tr. 7820 *et seq.*

a. Most of these effects and alternatives were in fact considered by the Board. Thus, the environmental (as well as safety) consequences of the location of the plant in close proximity to a large chemical plant were factored into the Board's decision.[130] The alternative of not building the plant at all is inherently part of the cost-benefit analysis which was carried out by the Board.[131] The applicant's ability to obtain electricity from other sources was the subject of extensive testimony,[132] which fully supports the Board's finding that "outside sources are unavailable."[133]

Some of intervenors' contentions in these exceptions seek to expand the NEPA review well beyond the pale of what we view as required by NEPA. Thus, while the scope of NEPA consideration of alternatives clearly extends beyond those which an agency itself may effectuate (see *Natural Resources Defense Council* v. *Morton,* 458 F.2d 827 (D.C. Cir. 1972)), a rule of reason nevertheless applies. *Id.* at 837. Contrary to intervenors' view,[134] and giving effect to that rule, the Board was not required to analyze the use to which Consumers' customers might put the power generated by the Midland plant to ascertain whether that use would have an adverse environmental impact. The Board made a finding that the "postulated demand is made up of normal industrial and residential use" and that it need not inquire into the propriety of such customary uses of electricity. We agree.[135]

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[130] Initial Decision, pars. 12, 14, 16, 46, 54, 55, 56, 57, 64-66, 76. In part VIII of this decision, *infra,* we have supplemented the Board's findings regarding "synergism," as appearing in paragraphs 64-66 of the Initial Decision.

[131] Initial Decision, pars. 45-49, 70-75.

[132] *E.g.,* Tr. 8070-1, 8076-8.

[133] Initial Decision, par. 70.

[134] Saginaw Intervenors' Exceptions, p. 73.

[135] A proposed Commission guide for the preparation of environmental reports, dated August 1972, included a statement which possibly could be construed as requiring consideration of "externalities"—the end uses of electricity. When the report was issued in final form in March, 1973, it was revised to indicate that only the analysis of certain environmental costs associated with the operation of the plant itself, and not costs associated with the uses of electricity, were contemplated. See U.S.A.E.C. Regulatory Guide 4.2, "Preparation of Environmental Reports for Nuclear Power Plants," Section 8.2 (March 1973).

Mapleton Intervenors' exception 8 must also be rejected for the same reasons.

b. As for the contention that the demand for electricity was artificially stimulated by the applicant's advertising, the Board stated that no evidence had been offered to support that contention; and that absent some evidence that applicant was creating abnormal demand, it [the Board] would not consider the question. We do not believe the Board acted unreasonably.

4. In exception IV. D. the Saginaw Intervenors claim that the Licensing Board scheduled the hearing sessions on environmental matters "in such a way as to preclude participation by [Saginaw] Intervenors and their counsel;" and, by so doing, denied such interventors "their due process right to participate in the environmental hearing."

Intervenors stress that the Licensing Board had refused to consider issues they attempted to raise concerning the validity of the ECCS Interim Criteria for the reason that the rulemaking proceeding on those criteria was still in progress. Intervenors further note that, at the same time, the Board denied their April 15, 1972 motion for an indefinite postponement of the Midland environmental hearing, which motion had been based upon their counsel's participation in that rulemaking proceeding. The impression intervenors seek to convey is that their counsel was required to be present at the ECCS proceeding during the

entire period of the scheduled environmental hearing and that, therefore, the Licensing Board was obligated to defer indefinitely the latter. In the totality of circumstances, however, the denial of the indefinite postponement was scarcely an abuse of discretion.

Long before the filing of the motion for postponement, intervenors' counsel had been put on notice by the Board's order of January 6, 1972, that he must make adequate preparation to handle his commitments. Moreover, the notice of hearing for the ECCS proceeding made it clear that the scheduling of licensing proceedings was not to be delayed because of the lack of completion of the rulemaking proceeding.[136] Nevertheless, the Saginaw Intervenors demanded an indefinite adjournment and offered no alternative dates when they were prepared to participate in the environmental hearing.[137]

As indicated in the initial decision, the environmental hearings began on May 17, 1972 and ended on June 15, 1972, after fourteen days of hearings.[138] The record discloses that the hearings in fact took place on the following days: May 17, 18, 19, 22, 23, 24, 25, 30, 31, June 11, 12, 13, 14, 15. An examination of the record of the ECCS proceeding indicates that those hearings were in recess on seven of those days, that the CNI (whom Saginaw Intervenors' counsel represented in the ECCS proceedings) was represented by another counsel on an additional three of the overlapping days, and that the Saginaw Intervenors' counsel participated in the ECCS proceedings on only four of the days when the two proceedings overlapped. Thus on ten out of fourteen of the overlapping days, the Saginaw Intervenors' counsel participated in neither the Midland nor the ECCS proceedings.

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[136] 37 *F.R.* 288, 289 (January 8, 1972).

[137] See Tr. 5253.

[138] Initial Decision, par. 8.

The scheduling of regulatory proceedings is governed by a number of considerations, only one of which is the convenience of counsel. The Licensing Board has broad discretion in this respect. While it undoubtedly should attempt to accommodate legitimate requests for postponement, it is not required to accede to blanket requests for indefinite postponement which are not accompanied by a good-faith attempt to define a mutually convenient schedule. In any event, counsel who participate in AEC proceedings have an obligation not to over-extend their commitments so as to frustrate the objective of bringing licensing proceedings to a conclusion within a reasonable time frame.

5. In exception IV. I. the Saginaw Intervenors challenge the adequacy of the Final Environmental Statement, and of the Licensing Board's review of that statement, on the basis that the statement failed to include a discussion of reliable scientific fact and opinion which is contrary to the position taken by the agency, and the Licensing Board failed to correct such alleged deficiencies. The intervenors list 8 areas as representative of those "in which there is contrary scientific fact and opinion;" and which are omitted from the impact statement:

a. adequacy and effectiveness of the ECCS

b. reactor pressure vessel failure

c. adequacy of certain valves

d. adequacy of analysis dealing with fuel densification

e. reliability of generation of electricity from nuclear plants

f. genetic effects from cumulative exposure to radiation

g. nature and character of unresolved safety issues, as discussed in "each ACRS letter ever written"

h. adverse effects associated with production of products of Dow Chemical Co.

Citing authority to the effect that "NEPA is, at the least, a law requiring full disclosure," the intervenors find error in the asserted omission of scientific opinion in those areas from the environmental review of this facility.

The only authority cited by intervenors which is possibly relevant to this exception is *Committee for Nuclear Responsibility* v. *Seaborg,* 463F. 2d 783 (D.C. Cir. 1971), where the court ruled that the environmental impact statement for the "Cannikin" nuclear test should set forth "opposing scientific views" and should not completely omit "any reference whatever to the existence of responsible scientific opinions concerning possible adverse environmental effects." The court emphasized that an agency had some discretion in this respect, and that only "*responsible* views need be included." 463 F.2d at p. 787.

This *Cannikin* decision involved questions quite different, and readily distinguishable, from those presented here. At issue there was an agency's preparation of an impact statement for a governmental activity which was not subject to a prior adjudicatory hearing. On the other hand, in an AEC licensing proceeding, the Commission's regulations provide that a party who believes the environmental impact statement is deficient will have the opportunity to present proof in support of his position at the public hearing. The intervenors had that chance here. Interestingly, the *Cannikin* court which found the statement deficient only required that the plaintiffs be given an opportunity to make their submissions on the point discussed in the opinion—no greater relief than what was in fact afforded to intervenors here.

From our understanding of the items covered by this exception, it appears that a variety of views on these

items have indeed been analyzed in this proceeding, or else have been properly regarded as outside its scope. Furthermore, the Saginaw Intervenors could have participated in the environmental hearings and could have sought to bring the opposing views which they wished to sponsor to the fore, but they chose not to do so.[139] Moreover, the impact statement, as well as the initial decision, discusses a broad variety of environmental subjects and views, encompassing the areas in which the intervenors find deficiencies. Not all of the views considered are favorable to nuclear plants in all respects. In the totality of circumstances, this exception must be denied.

6. In exception V. F. the Saginaw Intervenors assert that the Board should have considered issues concerning the environmental effects of the uranium fuel cycle. As they recognize, such consideration is precluded by our earlier ruling in this case in ALAB-60,[140] to which we adhere. See also ALAB-99.[141]

The same issues are raised by the second part of exception V.H. which asserts error in the Board's failure to quantify (or even to consider) the environmental effects of the storage of long-lived radioactive waste products. This matter is similarly governed by ALAB-60 and ALAB-99.

7. Both the Saginaw and Mapleton intervenors except from the Licensing Board's resolution of issues concerning the environmental effects of fogging and icing

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[139] The Mapleton Intervenors presented testimony by Dr. Sternglass in the area covered by item f. (i.e., a challenge to 10 CFR Part 20), but the Licensing Board declined to adopt Dr. Sternglass' views. *Cf. Trustees of Columbia University in the City of New York,* ALAB-50, WASH-1218 320, 336-349 (May 18, 1972).

[140] ALAB-60, WASH-1218 (Suppl. 1) 459 (July 19, 1972).

[141] *Long Island Lighting Co.* (Shoreham Nuclear Power Station), ALAB-99, RAI-73-2 53 (February 1, 1973).

associated with the cooling pond. In paragraph 69 of the initial decision, the Licensing Board rejected the Mapleton intervenors' evidence on this subject, finding that it did not support the contention that there would be substantial fogging and icing in the area around the cooling pond (including Mapleton). The Board found the likely effect on Mapleton to be "negligible" and, even in the area close to the pond, as "insubstantial and the environmental costs minimal." The Board also found, however, that further studies of the effects of cooling ponds were needed.

The Saginaw Intervenors, in exception V. I., and the Mapleton Intervenors, in exception 10, challenge the apparent inconsistency between the finding of a need for further study of cooling ponds and that concerning the minimal or negligible effects of such ponds. There is substantial evidence of record, offered by the applicant and the staff, supporting these latter conclusions. But relative to the need for further study, a staff witness testified that the report prepared by the applicant on this subject was the first systematic study of steam fog from a cooling pond that attempted to relate data to atmospheric conditions for the purpose of prediction of fog formation. He also testified that he disagreed with many aspects of the report.[142] The staff witness indicated, however, that the study was conservative, and that it probably over-predicted rather than under-predicted the fog and icing effects of the cooling pond.[143]

The Final Environmental Statement recommended that the applicant develop an ecological surveillance and monitoring program "which will document the impact of the plant operations upon the ecology of the site and environs."[144] The Board quite understandably stated that

[142] Tr. 7441-2.

[143] Tr. 7445, 7461-2.

[144] Final Environmental Statement, Summary and Conclusion, item 7(d). The applicant has agreed to follow this recommendation. (Initial Decision, par. 78.)

the applicant should include in its surveillance program a study of the duration, intensity and extent of fog and icing in the surrounding area. That statement is entirely consistent with the Board's findings, which are supported by the record, that the environmental effect from fogging and icing seems likely to be negligible or insubstantial.

8. Saginaw Intervenors' exceptions V.J. and V.K. assert that, in its environmental review, the Licensing Board failed to take into account and quantify the "unreliability of nuclear power plants as evidenced by the [Commission's] reactor operating reports," and the "effect, if any, • • • on the economic operation of the Midland plant if current Government subsidies of uranium fuel are eliminated or if current resources of uranium are depleted" during the plant's useful life.

Before the Licensing Board, the Saginaw Intervenors raised the question of the economics and reliability of nuclear power plant generation.[145] However, they offered no evidence on this question. In their exceptions, they ask us to take "official notice" of the (1) various "unresolved problems associated with nuclear power," (2) the purported failure of the nuclear industry to have resolved quality assurance and quality control matters; (3) all Reactor Operating Reports; and (4) the "current difficulties surrounding the construction of the breeder."

The record, however, includes specific information concerning the reliability of nuclear power, which indicates that the reliability of nuclear plants and fossil plants are roughly equivalent.[146] Absent any contrary evidence, there

[145] Statement of Environmental Contentions, dated February 6, 1972.

[146] Final Environmental Statement, p. XII-6; Tr. 8085, 8086. See also ALAB-106, *supra*.

was no reason for the Board to factor differing reliability estimates into its evaluation of nuclear and other plants as alternatives. As for the alleged effects of the withdrawal of government subsidies of uranium fuel, or the depletion of uranium supplies, the only evidence of record on this subject indicated that the purported subsidies do not exist,[147] and that uranium would continue to be available over the life of the plant.[148]

Given this state of the record, we find no error in the Licensing Board's disposition of these matters.

9. In their exception V.L. the Saginaw Intervenors question the continuing validity of the Commission's regulations in 10 CFR § 50.35, which permit issuance of a construction permit prior to the resolution of certain isues or the gathering of certain data, subject to certain conditions. The intervenors contend that NEPA invalidates this procedure, and requires that both the safety and environmental judgments with respect to the facility be made on the basis of a "completely designed facility."

This provision of AEC regulations is, of course, an integral part of the Commission's two-step licensing procedure. That procedure, as intervenors recognize, was explicitly sanctioned by the Supreme Court in *PRDC* v. *International Union of Electrical, Radio and Machine Workers, AFL-CIO,* 367 U.S. 396 (1961).[149] That decision, which involved the Commission's safety regulations, approved a regimen where a construction permit could be issued even though final design of all components of a reactor had not been completed, and even though information necessary to

[147] Tr. 7034-38, 7924-37.

[148] See, *e.g.*, FES, p. XII-5; Tr. 6588-92; 7920.

[149] Contrary to intervenors' apparent belief (see exceptions, p. 125, fn. 82) we do not read *PRDC* as being premised on any requirement for a mandatory hearing at the operating license stage.

be considered prior to operation of the reactor had not yet been compiled. One necessary predicate for such issuance, however, is findings by the Commission that such further technical or design information as might be required to complete the safety analysis, and which could reasonably be left for later consideration, would be supplied prior to reactor operation. Additionally, it must be found that safety features or components which require research and development have been described by the appplicant and that the applicant has identified, *and there will be conducted,* a research and development program reasonably designed to resolve any safety questions associated with such features or components.[150]

When an applicant receives a construction permit predicated upon such findings, it proceeds at its own risk. Prior to operation, the applicant must satisfy all safety requirements; and if additional research performed or data acquired during construction indicates that any safety requirement cannot be satisfied, the operating license must be denied or appropriately conditioned. As *PRDC* indicates, this is so regardless of the amount of money which an applicant may have expended during construction.

The same conditions govern the Commission's environmental review. At the construction permit stage, a licensing board is required to undertake a thorough analysis of the projected environmental effect of the reactor. Where additional information is needed, a board may permit the development of such information during construction. Nevertheless, with regard to aspects of plant operation which may have an environmental impact—*e.g.*, effluent releases which are governed by proposed Appendix 1 to 10 CFR Part 50—the plant must meet AEC regulatory standards prior to operation.

[150] See 10 CFR § 50.35(a).

NEPA did not overturn the *PRDC* decision, either expressly or by implication. As one court has stressed, it would be "wholly impracticable to require that the ultimate environmental design • • • be included in the EIS. • • • An undertaking of such magnitude is beyond the scope of § 102(2)(C)." [151] Thus, in requiring the preparation of environmental impact statements, NEPA requires a thorough analysis of such information as can reasonably be obtained —and no more. As with safety matters, where further information is needed, it must be obtained prior to issuance of an operating license, so that applicable environmental standards will be satisfied.[152]

The regulations of the Commission are consistent with this view. Exception V. L. is accordingly denied.

10. The Mapleton Intervenors, in their exceptions 5, 6 and 7, take issue on a generalized basis with all of the Licensing Board's enviromental findings and conclusions. The only particular contentions which we can isolate from the broad generalities asserted are those challenging the findings in paragraph 73 of the initial decision (issues which we have dealt with in Part IV. 4.b, *supra*); those challenging the Board's cost-benefit balancing (see Parts IV.4.b and XI. 1, *supra*); and those challenging the Board's treatment of the environmental effects of major accidents (see Part IX, *supra*) and low-level radiation releases (see Part IV. 4.b, *supra*). These exceptions are denied for the same reasons that we rejected comparable assertions made by the Saginaw Intervenors.

11. In exception 11, the Mapleton Intervenors except to the Board's asserted refusal to consider evidence pur-

[151] *EDF v. Corps. of Engineers*, 348 F. Supp. 916, 938-39 (N.D. Miss. 1972).

[152] § 185, Atomic Energy Act, 42 U.S.C. 2235; *Cf. Arkansas Power and Light Co.* (Arkansas Nuclear One Unit 2), ALAB-94, RAI-73-1 25, 30 (January 18, 1973).

portedly offered by those intervenors on "the hazards of Electro-Magnetic Pulse (EMP)." The exceptions do not identify the subject matter or content of the evidence offered, or the occasion when the alleged offer of proof was turned down. Lacking any particularity whatever, this exception must be denied. See 10 CFR § 2.762(a).[153]

XII. Water Quality Requirements

In its NEPA balancing, the Licensing Board considered the contemplated thermal discharges from this plant.[154] Relying on studies conducted by the Michigan Water Resources Commission, the Michigan Department of Natural Resources, and Dow Chemical Co., the Board found the Tittabawassee River to be of "depressed quality." It further found, however, that the Michigan Water Resources Commission was implementing a program to upgrade the river; that there will be "some destruction" of aquatic life although, in view of the present quality of the river, the amount was conjectural; but that even after improvement of the river, "the aquatic life destroyed should not be significant." [155]

The Board required the applicant to conduct a thorough ecological study prior to plant operation to establish base line values, and noted that the applicant "has committed itself to discharges that are significantly lower than those permitted by the standards for thermal releases and total

[153] At one point in the proceeding, the Mapleton Intervenors indicated that they wished to offer testimony on "the effect of a lack of electromagnetic capability on the environment should the plant be built." (Tr. 2685). The Board expressed the belief that this issue was "outside the scope of the issues in this proceeding" (Tr. 2688) but gave the intervenors the opportunity to submit an offer-of-proof in writing (Tr. 2690). The intervenors failed to take advantage of that invitation.

[154] Initial Decision, par. 62-63, 77.

[155] *Id.*, par. 63.

dissolved solids." In the latter connection, the record indicates that the applicant has committed itself to a cooling system designed to "limit the temperature of the pond discharge [into the river] to approximately 1°F above the ambient temperature of the river;"[156] and that State standards currently would permit a rise of 5°F above ambient temperature.

Under NEPA, the Board's handling of the thermal issue was appropriate, and the balance struck was reasonable. However, on October 18, 1972—after the close of evidentiary hearings but prior to the initial decision—the Federal Pollution Control Act Amendments of 1972 (P.L. 92-500, 86 Stat. 816, hereinafter FWPCA) became law. The FWPCA, as recognized by the Commission's Interim Policy Statement,[157] is applicable to licensing proceedings such as this, where no final Commission action had been taken prior to October 18, 1972.

Our recent *Hanford* decision discussed the impact of the FWPCA on proceedings such as this one.[158] The FWPCA may affect the Commission's NEPA responsibilities in the area of water quality. The Commission's NEPA responsibilities will be modified as various implementing actions are taken under the FWPCA by the Environmental Protection Agency and the State. The Policy Statement harmonizes the AEC's licensing responsibilities under NEPA with the requirements of the FWPCA to assure that, until various FWPCA implementing actions are taken, the Commission will continue to carry out its NEPA functions in full.

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[156] FES, p. III-8.

[157] "Interim Policy Statement on Implementation of Section 511 of the FWPCA" (Policy Statement), 38 *F.R.* 2679, January 29, 1973.

[158] *Washington Public Power Supply System* (Hanford No. 2 Nuclear Power Plant), ALAB-113 (April 12, 1973).

On February 28, 1973, the State of Michigan's Water Resources Commission certified that with respect to the Midland Nuclear Plant, "pursuant to Section 401 of the FWPCA, as amended, • • • there is not an applicable effluent limitation or other limitation under Sections 301(b) and 302 of the FWPCA • • • and there is not an applicable standard under Sections 306 and 307 thereof."[159]

The applicant (through its counsel at the oral argument before this Board) committed itself to adhere to whatever standards might be imposed by the FWPCA.[160] Moreover, the applicant will be required, without any implementing action on AEC's part, to comply with applicable limitations or other requirements promulgated or imposed pursuant to the FWPCA.

In these circumstances, we are justified in determining that the Midland facilities will comply with the applicable limitations or other requirements of the FWPCA.

While State law would apparently permit a variation in ambient temperature of up to 5°F, the applicant has agreed with the State of Michigan to meet a 1°F limitation. This agreement is between the State of Michigan and the applicant and is not a result of any condition imposed in this proceeding. The Licensing Board performed its NEPA balance in the water quality area on the basis of the agreed-to limitation. The Board has carried out its NEPA func-

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[159] The Section 401 certification is in addition to the certification received by the applicant on March 12, 1971, under Section 21(b), the section of the FWPCA which prescribed the certification requirements prior to its October 1972 amendments. We need not rely on that certification in this proceeding because of the February 28, 1973, Section 401 certification. We note that the Environmental Protection Agency has also conducted the review of Michigan's water quality standards (in effect prior to the October 1972 amendments to the FWPCA), as provided by Section 303(a)(1) and (a)(2) of the FWPCA.

[160] AB Tr. 110, 147-8.

tions in the water quality area in full so that there is no gap in the environmental review in that area.[161]

XIII. Remaining Exceptions

We have carefully considered all of intervenors' other exceptions and find them without merit. With respect to the Saginaw Intervenors' claim [162] that certain of the Licensing Board's findings and conclusions were not accompanied by a sufficiently detailed articulation of their basis, we have previously described the standard of specificity mandated by the applicable statutory and regulatory requirements as one which "requires communication of what has been decided and such findings as will permit the parties, the public, and a reviewing court to ascertain the agency's reasoning in reaching its decision." [163] We are satisfied that the initial decision meets that standard.[164] None of the remaining exceptions warrants any discussion at all.

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[161] Saginaw Intervenors' exception V.G. contends that the Licensing Board failed to do an independent cost-benefit analysis of the State of Michigan water quality standards. Authorities cited by the intervenors do not support this assertion. Section 511 of the FWPCA does not impose on Federal licensing agencies any such NEPA responsibility regarding water quality matters.

[162] Exceptions II. K., II. M. and IV. H.

[163] *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station, ALAB-73, WASH-1218 (Suppl. 1) 495, 497 (October 11, 1972). See also *Boston Edison Co.* (Pilgrim Nuclear Power Station), ALAB-83, WASH-1218 (Suppl. 1) 552, 569 (December 4, 1972); *Trustees of Columbia University in the City of New York,* ALAB-62, WASH-1218 (Suppl. 1) 464, 465 (July 28, 1972).

[164] Moreover, intervenors' failure to file adequate proposed findings and conclusions gives a hollow ring to their claim that the Licensing Board should have gone into greater detail.

XIV. Conclusion

For the reasons stated above, the authorization of the issuance of construction permits to the Midland facility was correct. Accordingly, subject to the modification directed in ALAB-106, the initial decision of the Licensing Board is *affirmed.*

It is so ORDERED.

For the Atomic Safety and Licensing Appeal Board

Margaret E. Du Flo
Secretary to the Appeal Board

Dated: May 18, 1973

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

ALAN S. ROSENTHAL, *Chairman*
DR. JOHN H. BUCK, *Member*
WILLIAM C. PARLER, *Member*

In the Matter of
CONSUMERS POWER COMPANY (Midland Plant, Units 1 and 2) — Docket Nos. 50-329, 50-330

Memorandum and Order

November 26, 1973

(ALAB-160)

Saginaw Intervenors have filed what they choose to characterize as a motion "to clarify" ALAB-123, RAI-73-5 331 (May 18, 1973). The motion is based upon the November 6, 1973 memorandum and order of the Commission in *Niagara Mohawk Power Corporation,* (Nine Mile Point, Unit No. 2), Docket No. 50-410, RAI-73-11 995. In that memorandum and order, the Commission reversed certain prehearing conference orders of a licensing board insofar as they precluded the presentation of evidence on energy conservation. The proceeding was remanded to that board with appropriate directions.

Despite the label appended to it, the Saginaw Intervenor's motion appears in actuality to assert a conflict between ALAB-123 and the *Nine Mile Point 2* memorandum and order. In a real sense, the relief which the Saginaw Intervenors seek is a remand of *Midland* to the Licensing Board "for further proceedings to consider questions of energy conservation" (Motion, p. 22).

ALAB-123 was rendered more than six months ago. It affirmed, with a limited exception not here relevant, the initial decision of the Licensing Board.[1] In the circumstances, we think it at best doubtful whether we now are empowered to entertain what is essentially a new attack by the Saginaw Intervenors upon the initial decision. Be that as it may, since the motion is based exclusively upon a recent ruling of the Commission, it seems to us that the Commission itself is the body which should decide whether the sought reopening of the *Midland* proceeding is warranted. This is especially so since, in its *Nine Mile Point 2* memorandum and order, the Commission made specific reference to ALAB-123 (as well as to our more recent decision in *Long Island Lighting Co.* (Shoreham Nuclear Power Station), ALAB-156, RAI-73-10 831 (October 26, 1973).

Accordingly, the motion is referred to the Commission for such disposition as it may deem appropriate.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

MARGARET E. DUFLO
Secretary to the Appeal Board

[1] The only issues left open by ALAB-123 related to quality assurance matters. Over six weeks ago, those matters received final disposition on our part. ALAB-152, RAI-73-10 816 (October 5, 1973).

ATOMIC ENERGY COMMISSION REPORTS

Volume 7

OPINIONS AND DECISIONS OF THE
ATOMIC ENERGY COMMISSION
WITH SELECTED ORDERS

January 1, 1974, to June 30, 1974

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

CLI-74-5

COMMISSIONERS:

DIXY LEE RAY, *Chairman*
CLARENCE E. LARSON
WILLIAM O. DOUB
WILLIAM A. ANDERS

In the Matter of — Docket Nos. 50-329
CONSUMERS POWER CO. — 50-330
(Midland Plant, Units 1 and 2) — January 24, 1974

Mr. HAROLD F. REIS, for the applicant.

Mr. MYRON M. CHERRY, for the Saginaw Intervenors.

Messrs. MILTON R. WESSEL and JAMES N. O'CONNOR, for the Intervenor Dow Chemical Co.

Messrs. DAVID E. KARTALIA and ALBERT V. CARR, for the AEC Regulatory Staff

HEADNOTE

Commission clarified its position (Niagara Mohawk Power Corp., CLI-73-028, RAI-73-11-995) relative to licensing consideration of energy conservation issues and reaffirmed its approving citations to Shoreham (ALAB-156, RAI-73-10-831) and Midland (ALAB-123, RAI-73-5-331) proceedings. The Niagara decision was not meant to give indiscriminate approval to any energy conservation contention but, rather, instructed ASLB against barring "at the threshold" those basic issues that could have bearing on electrical demand projections. The Commission also affirmed both ASLAB and ASLB handling of the challenged issues and denied motion to reopen hearing. See also pending judicial cases (Aeschliman v. AEC, No. 73-1776, and Saginaw Valley Nuclear Study Group v. A.E.C., No. 73-1867, before D.C. Cir.) which were held in abeyance (Anchor Line Ltd. v. F.M.C., 299 F.2d 124 (D.C. Cir.), cert. denied, 370 U.S. 922 (1962)) pending agency consideration of this motion.

Guidelines must be developed on case-by-case basis due to varying circumstances and generality of "energy conservation" concept. However, as a basic threshold test, energy conservation issues: (1) must relate to some action, methods, or developments that would curtail demand for power to a level at which the proposed facility would not be needed; (2) must pertain to an alternative that is reasonably available; and (3) impact of proposed alternatives on demand must be susceptible to a reasonable degree of proof. See N.R.D.C. v. Morton, 458 F.2d 827 (D.C. Cir. 1972). Individual merits of four types of energy conservation contentions (end uses of electricity, validity of demand projections, promotional activities by applicant, and rate structure) were evaluated for admissibility as issues.

In view of broad discretion given administrative agencies to limit or preclude retroactive application of new rules developed in adjudication, Commission stated its position

not to apply Niagara decision retroactively to cases which had progressed to final order and issuance of construction permits before decision date. See S.E.C. v. *Chenery Corp., 332 U.S. 194 (1947); Department Store Union v. N.L.R.B., 466 F.2d 380 (D.C. Cir. 1972); N.L.R.B.* v. *Majestic Weaving Co., 355 F.2d 854 (2nd Cir. 1966).*

In agency licensing proceedings where public interest findings are requisite, burden of proof for ultimate permit or license issuance rests on applicant (Administrative Procedure Act 7(c); 10 CFR 2.732); however, Commission regulations under 10 CFR 50 App. D place responsibility on applicant ((A.1)(c)), staff (A.8), and ASLB (A.11) for possible consideration of energy conservation alternatives. Yet, in this emergent stage of novel and evolving energy conservation concept, intervenors also have responsibilities to state clear and reasonably specific contentions in a timely fashion, with an affirmative showing if these novel contentions are to be explored further (United Church of Christ v. *F.C.C., 425 F.2d 543 (1969)).*

Memorandum and Order

BACKGROUND

The Saginaw Intervenors filed with the Atomic Safety and Licensing Appeal Board a motion to "clarify" the Board's principal decision (RAI-73-5-531) in the subject proceeding in light of our recent Memorandum and Order in *Niagara Mohawk Power Corporation* (Nine Mile Point, Unit No. 2), Docket No. 50-410, RAI-73-11-995. The Appeal Board decision, affirming (with a limited exception not relevant here) the initial decision of the Licensing Board, became final some months ago. Petitions to review that order are pending before the United States Court of Appeals for the District of Columbia Circuit.[1] In these cir-

[1] *Aeschliman* v. *AEC*, No. 73-1776, and *Saginaw Valley Nuclear Study Group* v. *AEC*, No. 73-1867.

cumstances, the Board referred the motion to us for such disposition as we might deem appropriate. ALAB-160, RAI-73-11-1002.[2]

Pursuant to our invitation, the applicant Consumers Power Co., the intervenor Dow Chemical Co., and the AEC Regulatory Staff have submitted responses to the Saginaw motion. Saginaw was granted permission to and did file a reply to these responses.

For the reasons set forth below, insofar as the Saginaw motion seeks to reopen these proceedings, it is denied.

THE SAGINAW MOTION

The Saginaw motion reads the Appeal Board's decision in this case as holding that the Licensing Board "properly excluded consideration of energy conservation issues raised by the Saginaw Intervenors," Motion, pp. 1-2. Read in that light, Saginaw contends that the decision conflicts with our recent *Niagara* ruling, where we said—

> It is true that the parameters of our statutory power to compel conservation are not clear. But it does not follow that all evidence should therefore be barred at the threshold. See *Long Island Lighting Co.* (Shoreham), ALAB-156, decided October 26, 1973, RAI-73-10, p. 852; *Consumers Power Co.* (Midland), ALAB-123, May 18, 1973, RAI-73-5, p. 352.

[2] Simultaneously with filing of the instant motion, the Saginaw Intervenors moved the Court of Appeals for an extension of time in which to file their brief until after disposition of the instant motion. Viewing the motion as, in substance, a request that the case be held in abeyance pending agency action (see *Anchor Line Ltd.* v. *FMC*, 299 F.2d 124 (C.A.D.C.), *cert. denied*, 370 U.S. 922 (1962), the Commission and the United States acquiesced in that procedure. The Court of Appeals directed that we rule on the motion to clarify and, if we find it necessary to reopen these proceedings, to request remand, by January 28, 1974. Order of January 11, 1974.

Saginaw questions the appropriateness of our approving citations in *Niagara* to the *Shoreham* and *Midland* opinions, drawing our attention to allegedly inconsistent portions of those opinions discussing whether the nature of customer uses represented in projected demands for electricity may be placed in issue in licensing proceedings. Motion, pp. 5-6.

Prior to the environmental hearings in the subject proceeding, Saginaw submitted to the Licensing Board a "Statement of Environmental Contentions" listing 119 separate issues it sought to raise in the hearing. The instant motion undertakes to paraphrase 17 of these "contentions," which are now characterized as "energy conservation issues." Following discussion of certain Licensing Board rulings and the initial decision, Saginaw alleges that—

> It is clear beyond peradventure that the Saginaw Intervenors raised issues of energy conservation similar to (and in some cases identical to, e.g., rate structure) those raised by the intervenor in the *Niagara* docket. It is equally clear that the Licensing Board ruled as beyond the scope of the proceedings all issues of energy conservation except, perhaps, one (promotional advertising) . . . Motion, pp. 19-20.

Saginaw goes on to allege, in substance, that the Appeal Board broadly sustained exclusion of energy conservation issues, including the claim that the Appeal Board "made it quite clear that postulated demand may not be inquired into . . ." Motion, p. 21.

The Saginaw motion requests "clarification" of the Appeal Board's decision in accordance with its reading of *Niagara* and a remand of these proceedings for further hearings on energy conservation issues. In the alternative, Saginaw requests a decision making clear "how [the Appeal Board's decision here] and *Niagara* are consistent so

that an unambiguous record may be had in the prosecution of court appeals." Motion, p. 22.

The responses filed by the applicant and the Regulatory Staff contend, among other things, that Saginaw has misinterpreted our ruling in *Niagara,* the Appeal Board's rulings in this case and in *Shoreham,* and the relevant Licensing Board rulings in this case. They note that many of the issues Saginaw now claims were excluded were, in fact, allowed. They point out that some of Saginaw's paraphrases in the instant motion of the "energy conservation" issues it sought to raise before the Licensing Board distort the administrative record. They also contend that the alleged "energy conservation" issues which were excluded by the Licensing and Appeal Boards were properly excluded from this proceeding. We agree.

The Niagara Ruling

In our recent *Niagara* ruling, we dealt for the first time with the relevance in licensing proceedings of "energy conservation" issues—a rather general term we did not there attempt to define. Saginaw apparently reads *Niagara* to mean that virtually any action or development which might ultimately lead to reduced aggregate demands for electricity, including some having quite remote or speculative effects on demand, may be made an issue in a licensing proceeding. *Niagara* established no such sweeping proposition.

In *Niagara,* the intervenors made contentions concerning concrete measures they alleged might eliminate the need for electricity to be generated by the proposed plant. Those measures included—

(1) Selective load-shedding during periods of peak demand;

(2) Changes in the rate structure for electricity designed to decrease demand—such as modification of volume discounts, or raising prices during peak demand periods:

(3) Cutting wasteful uses of electricity, such as space heating, and

(4) Reducing promotional advertising which fosters demand for electricity.

Thus framed, these contentions, at least on their face, could have a bearing on the applicant's or Regulatory Staff's projections of demand—the basic issue to which energy conservation contentions are relevant in the licensing context. It was the Licensing Board's barring "at the threshold" of any consideration of any of these questions which we disapproved.

Our citation in *Niagara* to portions of the Appeal Board's rulings in *Shoreham* and *Midland* are fully consistent with what we have said. Thus, we cited with approval page 852 (RAI-73-10) of the Board's opinion in *Shoreham,* where the Board sustained the Licensing Board's finding that the applicant's projections of power needs were reasonable. The Licensing Board had admitted certain evidence offered by an intervenor to the effect that demand might be reduced by "further educating the public in conservation measures." The Licensing Board had found, however, that that evidence—

> . . . contained little practical guidance for action beyond the significant effort already being made, and no estimate of how much demand might be reduced . . .

The Appeal Board found this to be an "accurate appraisal," and stated that it might dispose of the intervenor's argument "simply on the basis that the evidence does not support it." The Appeal Board, then, clearly ruled that the "energy conservation" evidence actually offered in *Shoreham* was properly admitted, and we endorsed that ruling in *Niagara.*

The Appeal Board's *Shoreham* opinion goes on to discuss in rather lengthy dicta "the more fundamental issue of

whether questions concerning the *nature* of electrical demand are appropriate for consideration in a proceeding of this type." (Emphasis added.) *Id.* at 852-854. The Saginaw motion inaccurately characterizes this portion of *Shoreham* as a holding. Be that as it may, *Niagara* neither approves nor disapproves this portion of *Shoreham.*

Similarly, our citation in *Niagara* to page 352 of the *Midland* decision, as reproduced in RAI-73-5, referred to that portion of the opinion (paragraph 3b) discussing the Saginaw intervenor's contention that "the demand for electricity was artificially stimulated by the applicant's advertising."[3] Such a contention raises a legitimate issue, and this was recognized by both the Licensing Board and Appeal Board, although they did not use the label "energy conservation." However, no evidence was offered in support of this contention.

As we said in *Niagara,* this is a time of "deep national concern over energy sources and supply—a concern which the Commission fully shares." But the phrase "energy conservation" has a deceptively simple ring in this context. Taken literally, the phrase suggests a virtually limitless range of possible actions and developments that might, in one way or another, ultimately reduce projected demands for electricity from a particular proposed plant.

It would be neither possible nor desirable for us to lay down, at least at this juncture, very precise guidelines governing the kinds of energy conservation issues which should be allowed in licensing proceedings. Widely varying factual circumstances in individual cases, coupled with the inherent generality of the "energy conservation" concept, dictate that such guidelines be developed on a case-by-case basis, or, perhaps, through rulemaking. Nevertheless, certain

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[3] Our approving citation to page 352 of the *Midland* decision did not include the carryover paragraph from page 351 (paragraph 3a), which discusses whether inquiries into "the propriety of . . . customary uses of electricity" should be made.

basic considerations can be stated from the present vantage point. Purported energy conservation issues must meet a threshold test—they must relate to some action, methods or developments that would, in their aggregate effect, curtail demand for electricity to a level at which the proposed facility would not be needed. As discussed hereafter, several of Saginaw's alleged "energy conservation" issues have nothing to do with projected demand. Beyond that, the issue must pertain to an alternative that is "reasonably available."[4] *Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 834 (C.A.D.C. 1972). Furthermore, the impact of proposed energy conservation alternatives on demand must be susceptible to a reasonable degree of proof. Largely speculative and remote possibilities need not be weighed against a convincing projection of demand. Here, as with many other issues under the National Environmental Policy Act of 1969, a rule of reason applies. See *Natural Resources Defense Council* v. *Morton, supra.*

The contentions we approved in *Niagara* meet these tests. For example, possible restrictions on promotional advertising might well have a direct and appreciable effect on demand. The same may also be true of selective load-shedding during periods of peak demand, modifications of rate structures, or cutting wasteful uses of electricity. While the Commission might well lack authority to mandate such actions, that fact alone does not preclude our inquiry into seemingly feasible actions by State or other federal agencies. *Natural Resources Defense Council* v. *Morton, supra.*

The Saginaw "Energy Conservation" Contentions

The Saginaw motion alleges that, with the exception of one issue concerning promotional advertising, the Licensing

[4] For example, one of the Saginaw energy conservation contentions herein (contention 33) suggests investigating ways of generating electricity through means "not now known to man." Such suggestions need not be entertained.

Board ruled that issues of energy conservation were "as a matter of law, beyond the scope of the licensing proceeding." Motion, p. 15. As not above, the Saginaw motion paraphrases 17 of the 119 contentions it submitted to the Board, and characterizes them as "energy conservation" issues. Saginaw's current paraphrases of several of the contentions it actually submitted to the Board are inaccurate and misleading.[5] We deal, of course, with the contentions actually submitted to the Board.

The Saginaw "Statement of Environmental Contentions" was hardly a model pleading. As the Licensing Board noted, certain contentions of Saginaw's were "long on rhetoric and short on specificity."[6] Many contentions were redundant.[7] And many sought to raise multiple and more or less unrelated issues.[8] Although Saginaw now professes to view 17 of its 119 contentions as "energy con-

[5] For example, the motion states that contention 31 related to "promotional activities such as advertising or the sale of appliances." That contention did not refer to the sale of appliances.

The motion states that contention 32 "raised the question of various methods" of energy conservation. No "methods" were suggested by that contention. In fact, the contention referred only to "the possibility of changing the present social stimuli to society which could result in decreased demand for electricity." Such a vague generality is insufficient to raise a factual issue.

The motion states that contention 33 "raised the conservation issue of denying electricity to some customers and in particular Dow Chemical Company." The contention actually deals with the possibility of securing electricity from other sources, and has no bearing on energy conservation in the sense of reducing aggregate demand for electricity.

Similar distortions of the record occur with respect to contentions 49, 88, and 89.

[6] Order with respect to Environmental Issues, March 27, 1972, p. 7 (hereafter "Order").

[7] See, *e.g.*, contentions 31, 47, 75 and 76 concerning promotional activities.

[8] See, *e.g.*, contentions 33 and 34.

servation" contentions, its original submission to the Board did not point up any such common theme.[9]

In response to this diffuse barrage, both the Licensing Board and the Appeal Board dealt with the contentions by groups, except where they considered it necessary to refer to specific contentions. We will deal similarly with the alleged "energy conservation" contentions.

Summarizing the analysis which follows, we find that Saginaw properly raised one related group of legitimate energy conservation issues which the Licensing Board allowed. Saginaw obliquely raised a second energy conservation issue essentially similar to the rate structure issue we allowed in *Niagara,* which the Board also allowed. The Board properly excluded several alleged energy conservation contentions concerning certain customer uses of electricity. Finally, several other contentions of Saginaw's allegedly precluded by the Board were in fact allowed, but they had nothing to do with energy conservation.

1. Contentions Relating to Promotional Activities

Contentions 31, 47, 75 and 76 deal redundantly with the claim that the applicant has created artificial demands for electricity through advertising and other (largely unspecified) promotional activities. As we held in *Niagara,* contentions of this nature raise legitimate energy conservation issues. The Licensing Board authorized the introduction of evidence on such matters.[10] Saginaw never offered any

[9] Rather, the alleged "energy conservation" issues were scattered under four separate subject matter headings, only one of which had any direct bearing on energy conservation.

[10] The Board's order stated that "in its affirmative case, Saginaw should . . . specify the portion of the demand attributable to advertising by applicant and the basis of that conclusion." Order, p. 9. A similar promotional advertising contention was raised by the Mapleton Intervenors and allowed by the Board. Order, p. 14. In addition, the Board ruled generally that "the need for power from the proposed plant is, of course, an issue in this proceeding." Order, p. 10.

such evidence, and the Licensing Board held that absent some evidence that the applicant was creating abnormal demand, it would not consider the question. The record did contain substantial evidence and the Board found that "postulated demand is made up of normal industrial and residential use." The Appeal Board affirmed these rulings.

2. Contentions Relating to Rate Structure

The Saginaw motion alleges that contention 49—

> called into question the Michigan Public Service Commission's rate structure applicable to applicant's marketing of electricity arguing that the existing rate structure encourages rather than discourages demand.

Evidence pertaining to such a contention is admissible, as we held in *Niagara.* But no such contention was made here. Saginaw's contention 49 actually reads as follows:

> Applicant and the Michigan Public Service Commission have illegally created an incentive for continual construction of generating facilities when they are unnecessary. The rate structure imposed upon Applicant by the Michigan Public Service Commission encourages Applicant to create unwarranted costs upon the environment. Because Applicant's ability to receive a fair return on its invested capital is directly related to outstanding amounts of unamortized construction and other capital costs, Applicant has an incentive to continue to construct power facilities, whether necessary or not, in order to maintain an artificially high rate structure. Specifically, Intervenors contend that Applicant is failing to use existing generating facilities to the extent of their useful lives and it is taking such

> facilities out of base load or peaking service after such facilities have been amortized and removed from consideration of Applicant's rate structure. Thus, the proposed Plant represents an attempt to construct a facility in order to maintain an artificially high rate structure and, as such, it represents an unwarranted cost to the environment.

The burden of this contention, of course, is that the State's rate structure encourages construction of unneeded plants. Whatever the merits of that contention may be, it raises an entirely different issue from the issue we approved in *Niagara*. The *Niagara* issue, relating to rate structures which may possibly encourage high-volume consumption of electricity, bears on our concept of energy conservation. The Saginaw contention has, at best, a remote relationship to energy conservation.

Saginaw obliquely raised an issue essentially similar to the *Niagara* rate structure issue in the last sentence of its contention 88. Most of that contention was addressed to the separate issue whether projected growths of certain of the applicant's large industrial users were accurate. However, the contention concludes with the statement that—

> Concomitantly, applicant has failed to factor into its projection the possibility that rate structures will be revised so as to make large use of electricity on a per unit basis more expensive thereby discouraging the increased use of electricity.

Since the Licensing Board ruled generally with respect to the group of contentions in which this contention was included that "the need for power from the proposed plant is . . . an issue in this proceeding," its disposition of this contention is consistent with *Niagara*. No evidence was offered and the Board did not further consider this contention, consistent with our views (discussed hereafter) on burden of proof in this area. Nevertheless, it is appropriate to state our position that we will not apply *Niagara* retroactively to cases which had progressed to final order and issuance of construction permits before *Niagara* was decided.

Administrative agencies have broad discretion to limit or preclude retroactive application of new rules developed in adjudication. See *SEC* v. *Chenery Corp.*, 332 U.S. 194, 203 (1947); *Department Store Union* v. *NLRB*, 466 F.2d 380, 388-390 (C.A.D.C. 1972); *NLRB* v. *Majestic Weaving Co.*, 355 F.2d 854, 860-861 (C.A. 2 1966). Among the factors to be weighed are whether the new rule represents a departure from prior practice, the reliance of the parties on past practice and consequent burdens imposed by retroactive application of the new rule, and the governmental interest in applying it to past cases. Weighing those factors in this context, we believe that the balance of relevant considerations dictates prospective application of our decisions in the unfolding area of energy conservation.

3. Contentions Relating to Customer Uses of Electricity

Several of Saginaw's "environmental contentions" apparently relate, wholly or in part, to possible customer uses of electricity. Most of these contentions are too vague to raise a factual issue in this context. Thus, contention 32 speaks of "the possibility of changing the present social stimuli to society which could result in decreased demand for electricity . . . ." Contentions 73 and 74, which we treat below as relating to demand projections, also appear to question—by reference to "social and scientific stimuli" and "useful social stimuli"—the "validity" of certain customer uses of electricity. Contention 76, which also discusses promotional activities, questions "whether a demand is created by encouraging the public to use unnecessary and nonutilitarian products which use large amounts of electricity in the course of fabrication and production."

The Dow Chemical Company plant in Midland will receive process steam and electricity from the proposed plant. Contention 34 suggests that certain of Dow's products, such as "chlorinated hydrocarbons or 2-4-5-T" may be harmful to the environment. The Licensing Board excluded this contention, rejecting "the argument that this proceeding must consider the social values of the end uses of the power to be produced." [11] The Appeal Board affirmed this ruling, observing that such contentions "seek to expand the NEPA review well beyond the pale of what we view as required by NEPA." [12]

Contentions of this kind do not, in our view, raise legitimate energy conservation issues. For example, the Saginaw contention concerning the alleged environmentally harmful characteristics of some of Dow's products has, at best, a very speculative effect on demand. Dow and similar companies manufacture a wide range of products. Should one product be discontinued for environmental reasons, it is reasonable to assume that another product would take its place. Thus, Dow's energy requirements and the need for the proposed plant would not be affected.

Moreover, as the Appeal Board pointed out in *Shoreham,*[13] prediction of the environmental effects of the uses of electricity is highly speculative and remote from the basic question whether the proposed plant should be authorized. See *First National Bank of Homestead* v. *Watson,* 363 F.Supp. 466, 5 ERC 1497 (D.D.C. 1973). The record here, as in *Shoreham,* reflects that the facility is needed to satisfy normal residential and industrial demand. Giving effect, therefore, to the rule of reason applicable under NEPA, and absent special circumstances, Licensing Boards are

[11] Order, p. 8.

[12] ALAB-123, RAI-73-5-331, 351-352.

[13] *Long Island Lighting Company* (Shoreham Nuclear Power Station), RAI-73-10-831, 853 (1973).

not required to entertain contentions concerning alleged environmental effects of customer uses of electricity.[14]

We note, however, that even with respect to these issues the Board did not exclude proferred evidence "at the threshold." Rather, respecting Saginaw's repeated concern with "useful social stimuli," the Board stated that Saginaw could "postulate its own view of socila [*sic*] validity, and argue the proposition at an appropriate time." [15] Thus, Saginaw was invited to recast these contentions in more specific terms, an invitation it did not accept.

4. Contentions Relating to Projected Demand

Six of Saginaw's "energy conservation" contentions, fairly read, related to the validity of electricity demand projections generally and for the proposed plant. Thus, contention 73 alleges very generally that demand projections should be analyzed from the perspective of ways to decrease demands for electricity. Contention 74 states that possible availability of electricity from sources other than the proposed plant to meet projected demands must be analyzed. Contention 81 questions the applicant's projections concerning continued industrial growth in the State of Michigan. Contention 87 questions the applicant's assumptions concerning future uses of room air conditioners. Contention 88 alleges that the applicant had incorrectly analyzed projected growth of its major users of electricity, such as General Motors and Dow Chemical. Contention 89 questions an asserted relationship between gross national product and the automobile industry, as it relates to the applicant's demand projections. None of these contentions

[14] In addition, inquiries into environmental effects of customer uses could lead to virtually interminable hearings on collateral issues. The hearing transcript in this protracted proceeding is almost 8,000 pages long, and the entire record exceeds 24,000 pages.

[15] Order, p. 11.

raise valid energy conservation issues—i.e., they do not indicate ways in which concededly accurate demand projections might be reduced.

In any event, the Licensing Board ruled that "the need for power from the proposed plant is . . . an issue in this proceeding," thereby allowing each of these contentions.[16] The Saginaw motion makes no reference to this ruling, and Saginaw introduced no evidence concerning these contentions. The record contains substantial evidence supporting the applicant's demand projections.[17]

5. Other Contentions

Saginaw argues that four other "energy conservation" contentions were improperly excluded. These remaining contentions have nothing to do with energy conservation, as we define that concept.

Contention 33 is concerned with whether Dow Chemical could purchase power from other of the applicant's generating facilities, whether Dow might modify its existing fossil fuel facilities, or whether Dow and other customers might procure electricity through "conventional means" or "other means not now known to man." None of these contentions is relevant to the reduction of projected demands for electricity. On the contrary, these contentions postulate the validity of projected demands, and argue that they should be met from other sources. The Appeal Board stated in this connection that—

> The applicant's ability to obtain electricity from other sources was the subject of extensive testimony, which fully supports the Board's finding that "outside sources are unavailable."[18]

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[16] Order, p. 10.

[17] See Initial Decision, paragraph 47, TID-26300, pp. 214, 223.

[18] RAI-73-5-331, 351.

Contention 72 alleged certain deficiencies in the regulatory staff's assessment of costs of generating electricity through nuclear power. These alleged deficiencies related entirely to radiological matters. Contention 85 questions the applicant's assertion that the proposed plant will "maintain and enhance living standards." In a similar vein, contention 92 appears to question whether the need for electricity will provide jobs for an increased number of adults. The latter two contentions are too vague to raise an issue in this context and, in any event, seemingly have nothing to do with energy conservation.

SAGINAW'S PROCEDURAL DEFAULTS—BURDEN OF PROOF

Contrary to Saginaw's argument, its validity framed energy conservation contentions were allowed by the Licensing Board. We also believe, however, that serious procedural defaults by Saginaw in the course of these proceedings bear on the appropriate disposition of this motion.

The record in this case does not reflect any out-of-hand rejection of Saginaw's alleged energy conservation issues. The Board was obviously troubled, however, by the vague and rhetorical quality of many of these contentions. As to several contentions, Saginaw was invited to make more specific submissions.[19] Further, the Board acknowledged that "written detailed questions would undoubtedly be useful in further refining the issues to be contested" and invited submission of such questions.[20] Saginaw did not respond to these invitations.

The Board scheduled a hearing on environmental issues for May 1972. On the ground that its counsel was engaged in other matters, Saginaw requested an indefinite postponement of that hearing. The Board justifiably denied that re-

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[19] See note 10, *supra*, and accompanying text, and page 28. [P. 272 this appendix.]

[20] Order, p. 2.

quest, and Saginaw did not appear or participate in the fourteen days of environmental hearings.[21]

Section 2.754 of our rules authorizes licensing boards to require submission of proposed findings of fact and conclusions of law by participating parties. All parties, including Saginaw, were directed to file proposed findings and conclusions.[22] The Saginaw submission stated with respect to environmental issues that they had "no conventional findings of fact to set forth." As the Licensing Board noted in its initial decision, this failure to file proposed findings and conclusions "made it virtually impossible in some instances to know whether particular issues of fact are contested."[23] Addressing the same point, the Appeal Board stated that "participation in this manner, in our opinion, subverts the entire adjudicatory process."[24] We agree. Particularly in these circumstances, Saginaw's complaint that it was not granted a hearing on alleged energy conservation issues comes with ill grace.

Saginaw argues in its reply that its procedural defaults are irrelevant. It contends that the Licensing Board must consider all environmental issues, whether contested or not, and that since the record in the case and the Board's decision do not in terms reflect consideration of "energy

[21] We agree with the Appeal Board's observation—"While the Board undoubtedly should attempt to accommodate legitimate requests for postponement, it is not required to accede to blanket requests for indefinite postponement which are not accompanied by a good-faith attempt to define a mutually convenient schedule. In any event, counsel who participate in AEC proceedings have an obligation not to over-extend their commitments so as to frustrate the objective of bringing licensing proceedings to a conclusion within a reasonable time frame." RAI-73-5-331, 352-353.

[22] Order of June 28, 1972.

[23] Initial Decision, TID-26300, pp. 214, 216 at n.10.

[24] ALAB-123; RAI-73-5-331, 332.

conservation," a remand for further proceedings is required.[25]

Established rules of burden of proof governing conventional civil litigation are not necessarily completely dispositive in agency licensing proceedings where affirmative public interest findings are requisite. See, *e.g., United Church of Christ* v. *FCC,* 425 F.2d 543, 546-550 (1969). Particularly is this true under NEPA, which, of course, imposes upon us an affirmative obligation to develop an adequate record upon which to assess the environmental impact of proposed nuclear plants. Giving appropriate recognition to these general principles, we must nevertheless have workable subsidiary rules for the orderly conduct of these proceedings.

The burden of proof on the ultimate question whether a permit or license should be issued is on the applicant. Administrative Procedure Act, § 7(c) (5 U.S.C. 556(d)); 10 CFR 2.732. This burden includes preparation of an environmental report describing the impact of the proposed action, including alternatives to the proposed action. 10 CFR Part 50, App. D, ¶ A.1(c). As *Niagara* makes clear, such alternatives may in particular cases include energy conservation alternatives. Consistent with NEPA, the Regulatory Staff must independently prepare draft and final environmental impact statements, including, in appropriate cases, discussion of energy conservation alternatives. Appendix D, ¶ A.8. And the licensing boards must, on the record thus developed, "independently consider the final balance among conflicting environmental factors" (Appendix D, ¶ A.11), including possible energy conservation factors.

[25] We attribute no significance to the absence of the phrase "energy conservation" from the record or the Board's decision. "Energy conservation" is only now becoming a term of art.

But workable rules in this setting must take into account that energy conservation is a novel and evolving concept.[26] NEPA "does not require a 'crystal ball' inquiry." *Natural Resources Defense Council* v. *Morton, supra.* at 837. This consideration has led us to hold that we will not apply *Niagara* retroactively. As we gain experience on a case-by-case basis and hopefully, feasible energy conservation techniques emerge, the applicant, staff, and licensing boards will have obligations to develop an adequate record on these issues in appropriate cases, whether or not they are raised by intervenors.

However, at this emergent stage of energy conservation principles, intervenors also have their responsibilities. They must state clear and reasonably specific energy conservation contentions in a timely fashion. Beyond that, they have a burden of coming forward with some affirmative showing if they wish to have these novel contentions explored further.[27]

This Commission, applicants, and public interest groups are involved in truly creative proceedings, hopefully striking reasonable balances between complex and frequently competing considerations. Particularly in this setting, there is a need for compliance with procedures designed to develop and refine the issues, and for a spirit of accommodation, if the system is to work. Saginaw fell far short in these respects.

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[26] In its initial effort to deal with energy conservation questions, we note that the Federal Power Commission stated that "conservation of energy is currently an evolving concept . . . without a uniformly accepted definition . . ." *Measures to Implement Conservation of Natural Resources,* adopted November 13, 1973, 38 *Fed. Reg.* 31963, 31964.

[27] We do not equate this burden with the civil litigation concept of a *prima facie* case, an unduly heavy burden in this setting. But the showing should be sufficient to require reasonable minds to inquire further. Compare *United Church of Christ,* v. *FCC, supra.*

Insofar as the pending motion seeks clarification of our *Niagara* ruling, it has been granted. The motion is, in all respects, denied.[28]

It is so ORDERED.

By the Commission

GORDON M. GRANT
Acting Secretary of The Commission

Dated at Germantown, Maryland,
this 24th day of January, 1974.

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[28] We have received a letter dated January 21, 1974, from Saginaw making additional allegations in support of its motion, and a telegram from the licensee in response. These submissions, as framed, do not affect our disposition of the matter.

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

CLI-74-7

COMMISSIONERS:
DIXY LEE RAY, *Chairman*
CLARENCE E. LARSON
WILLIAM A. ANDERS

In the Matter of
CONSUMERS POWER COMPANY — Docket Nos. 50-329
50-330

(Midland Plant, Units 1 and 2) — February 5, 1974

Mr. HAROLD F. REIS, for the applicant.

Mr. MYRON M. CHERRY, for the Saginaw Intervenors.

Messrs. DAVID E. KARTALIA and ALBERT V. CARR, for the AEC Regulatory Staff.

Memorandum and Order

We have yet another petition from the Saginaw Intervenors seeking to reopen the record in the subject proceeding.[1] Even though we recently denied one petition filed by these Intervenors, and so advised the United States Court of Appeals for the District of Columbia Circuit where judicial review of this proceeding is pending, Saginaw now seeks to reopen on still other grounds.

Saginaw claims that after the final agency decision in this proceeding, entered a number of months ago, changed

[1] The petition is jointly signed by the Sierra Intervenors, represented by the same counsel as Saginaw, who are participating in the separate show cause proceeding involving the Midland facility. That proceeding, described in our Memoranda and Orders of December 20, 1973, and January 21, 1974, RAI-73-12-1082 and 74-1-7, is limited to quality assurance issues, and has nothing at all to do with the points raised here by Saginaw.

circumstances require us to reassess the NEPA cost-benefit analysis concerning the Midland facility. One alleged change, based on newspaper clippings, relates to increased construction costs of the facility. The other asserted change, not substantiated by anything, is that Dow Chemical Company may not actually purchase process steam from the facility upon its completion. The latter charge is similar to one made by Saginaw in a postscript to a letter dated January 21, 1974.

We decline to reopen on the grounds asserted. It is almost inevitable that particular facts may change in complex cases like this one between the close of administrative hearings, final agency action, and judicial review. This is especially true in the case of economic costs, which always reflect the impact of inflation. If such changes were to trigger rehearings, "there would be little hope that the administrative process could ever be consummated in an order that would not be subject to reopening." *ICC* v. *Jersey City*, 322 U.S. 503, 514 (1944). A response filed by the licensee negates Saginaw's unsupported assertion concerning Dow.[2] Accordingly, the Saginaw petition is denied.

It is so ORDERED.

By the Commission

R. E. MCKINNEY
Acting Secretary of the Commission

Dated at Washington, D. C. this 5th day
of February, 1974.

[2] The time for filing responses to this petition was fixed at February 4, 1974. The licensee's motion to fix that time at February 8, 1974, is denied.

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

CLI-74-8

COMMISSIONERS:
DIXY LEE RAY, *Chairman*
CLARENCE E. LARSON
WILLIAM O. DOUB
WILLIAM A. ANDERS

In the Matter of CONSUMERS POWER COMPANY — Docket Nos. 50-329, 50-330

(Midland Plant, Units 1 and 2) — February 20, 1974

Mr. MYRON M. CHERRY, for the Saginaw Intervenors.

Memorandum and Order

On February 5, 1974 (RAI-74-2, p. 148), we denied a second petition from the Saginaw Intervenors seeking to reopen the record in the subject proceedings because of changed circumstances allegedly altering the NEPA cost-benefit analysis concerning the Midland facility. We have since received a letter from Saginaw supplementing that petition which we will treat as a petition for reconsideration.

Saginaw points out that under revised contractual arrangements between the licensee and The Dow Chemical Company, Dow will not be obligated to close down its existing fossil fuel generating facilities when steam and electricity become available from the Midland facility. This information was before us when we denied the last petition.* Moreover, it appears that notwithstanding these changed contractual arrangements, the Dow facilities may be operated only on a stand-by basis, or may be closed down.† In

*Opposition of Consumers Power Company, Attachment C.
†Id.

any event, the closing of Dow's fossil fuel facilities was but one of many factors in the overall NEPA cost-benefit analysis. Our review of the record as a whole shows that it was not a determinative factor. Accordingly, and in the interests of finality in these already protracted proceedings, we reaffirm our denial of the petition to reopen.

It is so ORDERED.

By the Commission

GORDON M. GRANT
Acting Secretary of the Commission

Dated at Germantown, MD this
20 day of February 1974.

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

CLI-74-15

COMMISSIONERS:
DIXY LEE RAY, *Chairman*
WILLIAM O. DOUB
WILLIAM E. KRIEGSMAN
WILLIAM A. ANDERS

In the Matter of CONSUMERS POWER Co. — Docket Nos. 50-329, 50-330

(Midland Plant, Units 1 and 2) — April 11, 1974

Memorandum and Order

We have previously denied the Saginaw intervenors' repeated efforts to reopen these proceedings on a number of different grounds,[1] one of which dealt with Saginaw's unsupported charge that, as a result of contract renegotiations, the Dow Chemical Company may not actually purchase process steam from the completed Midland facility. A response to the charge filed by the Licensee assured us that Dow remained contractually obligated to purchase steam. On the basis of that assurance, without calling for the contract itself, we denied a Saginaw petition to reopen.[2]

Since then, however, with our orders stemming from these proceedings pending review before the United States Court of Appeals for the District of Columbia Circuit,[3] Dow took the rather unusual step of moving to withdraw

[1] Consumers Power Co. (Midland Plant, Units 1 & 2), RAI-74-1-19; 74-2-147; 74-2-149.

[2] RAI-74-2-147.

[3] *Aeschliman* v. *AEC, Saginaw Valley Nuclear Study Group* v. *AEC*, Nos. 73-1776 and 1867.

from the judicial proceedings, and its motion was granted.[4] This development, coupled with Saginaw's continued assertions that Dow's obligation to purchase steam and electricity from the completed Midland facility may now be illusory,[5] prompted us to call for all contracts executed by these parties dealing with the Midland facility.

We have carefully reviewed the relevant portions of these contracts and reaffirm our prior determination that there are no "changed circumstances", as alleged by Saginaw, warranting a reopening of these proceedings. We think it sufficient to note that Dow has a contractual commitment to purchase large quantities of process steam from the completed facility, that substantial purchases of electricity are also contemplated, and that Dow's existing fossil-fueled facilities are to be maintained primarily on a stand-by basis.

The contracts are hereby made a part of the record, and we are sending copies of the contracts to the Saginaw and Mapleton intervenors.

It is so ORDERED.

By the Commission

GORDON M. GRANT
Assistant Secretary of the Commission

Dated at Washington, D. C.
this 11th day of April, 1974.

[4] Order of March 25, 1974.

[5] Brief for the Saginaw petitioners, pp. 2-3.

ATOMIC ENERGRY COMMISSION
[10 CFR Part 50]

ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE

Notice of Proposed Rule Making

Notice is hereby given that the Atomic Energy Commission is considering possible amendments to its regulations in 10 CFR Part 50, Appendix D, "Interim Statement of General Policy and Procedure: Implementation of the National Environmental Policy Act of 1969 (Public Law 91-190)," that would specifically deal with the question of consideration of environmental effects associated with the uranium fuel cycle in the individual cost-benefit analyses for light water cooled nuclear power reactors.

The Commission's regulation implementing the National Environmental Policy Act of 1969 (NEPA) in 10 CFR Part 50, Appendix D, requires that each draft and final detailed statement prepared pursuant to section 102(2) (C) of NEPA for a nuclear power reactor contain a cost-benefit analysis which, among other things, considers and balances the adverse environmental effects and environmental, economic, technical, and other benefits of the facility. This regulation further provides that the cost-benefit analysis will, to the fullest extent practicable, quantify the various factors considered.

In several nuclear power reactor licensing proceedings it has been argued that the cost-benefit analysis for the facility that is the subject of the licensing action should include costs and benefits associated with the uranium fuel cycle, such as environmental effects of reprocessing spent fuel and disposal of wastes resulting from reprocessing. Other

factors related to the fuel cycle include those associated with uranium mining and milling, uranium hexafluoride production, isotopic enrichment, fuel fabrication, and transportation associated with the above. It has been urged that in each power reactor case the contribution of the nuclear power reactor to the environmental costs associated with the fuel cycle activity should be ascertained and considered in the cost-benefit balance.

The Commission's Atomic Safety and Licensing Appeal Board has held that environmental impact statements for nuclear power reactors should consider, among other things, environmental effects of the transportation of irradiated nuclear fuel from the facility that is the subject of the licensing action, and the transportation of low level wastes and of high level solid wastes other than irradiated fuel from the facility to depositories, but should not consider environmental effects of reprocessing of irradiated nuclear fuel, the disposal of wastes resulting from reprocessing, or disposal of low and high level solid wastes. In the matter of Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), Docket No. 50-271, Memorandum and Order, June 6, 1972. Subsequently, the Appeal Board in that case held that mining and manufacturing of reactor fuel are not within the scope of the environmental review prescribed for nuclear power reactors by NEPA and the Commission's regulations (Decision, October 11, 1972).

In connection with the foregoing, it should be noted that in conjunction with the revision of Appendix D of 10 CFR Part 50 on September 9, 1971, there was transmitted by the Director of Regulation to applicants for licenses to construct or operate nuclear power plants, and made available to the public, a document dated September 1, 1971, which, among other things, indicated that applicants' environmental reports should describe the environmental effects of

the transportation of fuel elements from the fuel fabrication plant to the reactor as well as the transportation of spent fuel elements from the reactor to the fuel reprocessing plant and the transportation of packaged radioactive material from the reactor to low level waste burial grounds.

There are in the United States well over 100 nuclear power reactors in operation, under construction, or on order, and, in addition, three commercial nuclear fuel reprocessing facilities have received operating licenses or are under construction. The existence of a uranium mine or mill, uranium hexafluoride plant, enrichment facility, fuel fabrication plant, fuel reprocessing plant, or ultimate waste depository does not depend upon the licensing of any one nuclear power reactor, nor does the cold or irradiated fuel or waste from any one reactor make more than a fractional contribution, if any, to the effects of such activities or facilities. Uranium mining and milling, uranium hexafluoride production, isotopic enrichment, and fuel fabrication will contribute fuel to many nuclear reactors and the effects associated with fuel reprocessing and waste disposal will be those associated not only with nuclear power reactors now operating or under construction, but also with those that are no longer in operation and those that are planned for the future. There does not appear to be any way to ascertain with any degree of certainty which of the uranium mines or mills, uranium hexafluoride plants, isotopic enrichment facilities, and fuel fabrication plants in existence or to be operated in the future will contribute fuel to a given nuclear power reactor, or which of the various fuel reprocessing plants or commercial burial grounds now in existence or to be constructed from time to time will receive irradiated fuel or wastes from any given nuclear power reactor.

Many of the various elements in the nuclear fuel cycle involve varying methods or processes with different en-

vironmental and other effects and there is no reason to believe that during the useful life of any given nuclear power reactor other methods or processes with different effects will not be developed. In addition, effects of uranium milling and mining, uranium hexafluoride production, fuel element fabrication, spent fuel reprocessing, operation of licensed burial grounds, and transportation incident to each of the above, are, except as those activities are subject to agreement State jurisdiction, the subject of Commission NEPA review proceedings associated with issuance of materials or facility licenses that are separate from the review proceedings for issuance of licenses for nuclear power reactors.

Cost-benefit analyses of nuclear power reactor license applications should contain a full and frank disclosure and consideration of costs and benefits of the proposed action. The results of the application of this principle to the question of inclusion of environmental effects associated with the fuel cycle are not entirely clear. As the above discussion indicates, the fractional contribution, if any, of the environmental effects of the fuel cycle to the cost-benefit balance for a particular nuclear reactor is difficult, and may be impossible, to ascertain with any degree of certainty. This suggests that such matters, if they are to be considered at all, be considered in a generic fashion through the rule making process. The Commission's regulatory staff has prepared a report entitled "Environmental Survey of the Nuclear Fuel Cycle," dated November 6, 1972, which provides a basis for an informed consideration of the generic question of the environmental impact associated with the uranium fuel cycle in light water cooled nuclear power reactor licensing proceedings.

To aid the Commission in its consideration of possible amendments to Appendix D to 10 CFR Part 50 of its regu-

lations that would deal with the question of the account to be taken of the enviromental effects associated with the uranium fuel cycle in individual cost-benefit analyses for light water-cooled nuclear power reactors, interested persons are invited to submit comments and suggestions, together with relevant data and information, with respect to possible additions to 10 CFR Part 50 along the following alternative lines:

(1) In the case of light water-cooled nuclear power reactors, the applicant's environmental report and the Commission's detailed statement shall contain a full discussion of, inter alia, the environmental effects of the transportation of cold fuel to the reactor and irradiated fuel from the reactor to a fuel reprocessing plant and the transportation of low level waste and high level solid wastes (other than irradiated fuel) from the reactor to depositories. Those documents need not cover the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, disposal of low level and high level solid wastes or transportation related to such activities (other than transportation of cold fuel to, and irradiated fuel from, the reactor), since the environmental effects of those activities as related to a particular light water-cooled nuclear power reactor have been analyzed in the Commission's "Environmental Survey of the Nuclear Fuel Cycle" and, when factored into the cost-benefit analysis, are sufficiently small as not to affect significantly the resultant conclusion. The environmental effects of the latter activities will generally be considered in detail in proceedings in which approval for such activities, or closely related activities, is sought.

(2) Or in the case of light water-cooled nuclear power reactors, the applicant's environmental report and the

Commission's detailed statement shall contain a full discussion of, inter alia, the environmental effects of the transportation of cold fuel to the reactor and irradiated fuel from the reactor to a fuel reprocessing plant and the transportation of low level wastes and high level solid wastes (other than irradiated fuel) from the reactor to depositories. In such documents, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation and disposal of wastes resulting from such reprocessing, disposal of low level and high level solid wastes and transportation related to such activities (other than transportation of cold fuel to, and irradiated fuel from, the reactor) to the environmental costs of licensing the nuclear power reactor, shall be as set forth in the following Table S-3 of the Commission's "Environmental Survey of the Nuclear Fuel Cycle":[1]

[1] The "Environmental Survey of the Nuclear Fuel Cycle" provides the supporting data for this summary table.

TABLE S-3

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR NUCLEAR FUEL CYCLE (NORMALIZED TO MODEL LWR ANNUAL FUEL REQUIREMENTS)

Natural resource use	Total	Effluents — Chemical (MT)	Total
Land (acres):		Gases (including entrainment):[1]	
Temporarily committed	63	SO_x	4400
Undisturbed area	45	NO_x[2]	1170
Disturbed area	18	Hydrocarbons	11.3
Permanently committed	4.6	CO	28.7
Overburden moved (MT×10⁻⁶)	2.7	Particulates	1156
Water (gallons×10⁻⁶):		Other gases:	
Discharged to air	163	F_-	1.0
Discharged to water bodies	11,052	Liquids:	
Discharged to ground	123	$SO_4^=$	5.8
Total	11,338	NO_3^-	8.2
Fossil fuel:		Fluoride	0.4
Electrical energy (mw.-hr.×10⁻⁶)	317	Ca^+	5.4
Equivalent coal (MT×10⁻⁶)	116	Cl^-	8.2
Natural gas (s.c.f.×10⁻⁶)	103	Na	13.5
		NH_4	8.4
		Fe	0.4
		Tailings solutions (×10⁻⁶)	240
		Solids	91,000

Effluents—Radiological (curies)	Total	Maximum effect per annual fuel requirement of model 1000 MWe LWR
Gases (including entrainment):		
Rn-222	83	Principally from mills — Maximum annual dose rate <4 percent of average natural background within 5 miles of mill. Results in 0.06 man-rem per annual fuel requirement. Due to dilute concentration and short half-life of principal component, exposure beyond a 5-mile radius is minuscule relative to natural background.
Ra-226	.02	
Th-230	.02	
Uranium	.046	
Tritium (×10⁻⁶)	12	
Kr-85 (×10⁻⁶)	350	
I-129	.002	
I-131	.02	Principally from fuel reprocessing plants—Whole body dose is 4.4 man-rem for population within 50-mile radius. This is <0.005 percent of average natural background dose to this population.
Fission products	1.0	
Transuranics	.004	
Liquids:		
Uranium and daughters	2.4	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.027	From UF_6 production—concentration <5 percent of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	.27	
Th-234	.001	From fuel fabrication plants—concentration <1 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Other uranium daughters	.001	
Ru-106	4	From reprocessing plants—maximum concentration <4 percent of 10 CFR 20 for total reprocessing of 26 annual fue requirements for model LWR.
Tritium (×10⁻⁶)	6.2	
Solids (buried):		
Other than high level	1,200	From mills—included in tailings returned to ground—no significant effluent to the environment.
Thermal (B.t.u. ×10⁻⁶)	3,370	

[1] Estimated effluents based upon combustion of equ valent coal for power generation.
[2] 1.2 percent from natural gas use and process.

The Commission will hold an informal rule-making hearing on possible amendments described in (1) and (2) above on February 1, 1973, at 10 a.m. The location and the presiding officer will be designated in a notice that will be published in the FEDERAL REGISTER in the near future.

Interested persons are invited to attend the hearing and present oral or written statements. Any person who intends to present views at this hearing should furnish in writing his name and the name of the organization he represents to the Secretary of the Commission by January 1, 1973. The hearing will be conducted as a legislative-type hearing. Since the hearing will be part of a rule making, rather than an adjudicatory, proceeding, the provisions of Subpart G, "Rules of General Applicability," of 10 CFR Part 2, the Commission rules of practice, will not be applicable.

Nothing herein shall be construed as affecting the continuing validity of the above-described holdings by the Appeal Board in the Vermont Yankee proceeding during the course of this rule making proceeding, and they shall continue in effect unless and until modified by promulgation of a regulation or other Commission action.

All interested persons who desire to submit written comments or suggestions in connection with the possible amendments to Appendix D of 10 CFR Part 50 or the "Environmental Survey of the Nuclear Fuel Cycle," should send them to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Staff, within sixty (60) days after publication of this notice in the FEDERAL REGISTER.

Copies of comments on this notice as well as the "Environmental Survey of the Nuclear Fuel Cycle," dated November 6, 1972, may be examined at the Commission's Public Document Room at 1717 H Street NW., Washington, DC 20545. In addition, copies of the environmental survey may be obtained upon request addressed to the Deputy Director for Fuels and Materials, Directorate of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545.

(Sec. 161, 68 Stat. 948; sec. 102, 83 Stat. 853, 42 U.S.C. 2201, 4332)

Dated at Germantown, Md., this 10th day of November 1972.

For the Atomic Energy Commission.

PAUL C. BENDER,
Secretary of the Commission.

[FR Doc. 72-19698 Filed 11-14-72; 8:53 am]

ATOMIC ENERGY COMMISSION

[10 CFR Part 50]

[Docket RM-50-3]

ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE

Notice of Hearing

On November 15, 1972, the Atomic Energy Commission published in the FEDERAL REGISTER (37 F.R. 24191) a notice of proposed rule making concerning possible amendments to CFR Part 50, appendix D, that would deal specifically with the environmental effects associated with the uranium fuel cycle in the individual cost-benefit analyses for light water-cooled power reactors. The notice scheduled an informal rule making hearing on the possible amendments on February 1, 1973, at 10 a.m.

The location of the hearing will be New Executive Office Building, Room G-2008, 17th and H Streets NW., Washington, D.C.

A hearing board consisting of Max D. Paglin, Esq.—Chairman, Dr. Martin J. Steindler and Dr. John C. Geyer will preside.

As stated in the November 15, 1972, notice, the hearing will be part of a rule making, rather than an adjudicatory, proceeding and the provisions of Subpart G, "Rules of General Applicability," of 10 CFR Part 2, the Commission's rules of practice, will not be applicable.

The procedural format for the hearing will follow the legislative pattern, and no discovery or cross-examination will be utilized. It should be noted, however, that the report prepared by the Commission's regulatory staff, entitled 'Environmental Survey of the Nuclear Fuel Cycle," dated November 1972, which provides a basis for an informed

consideration of the generic question of the environmental impact associated with the uranium fuel cycle in light water-cooled nuclear power reactor licensing proceedings, is available to members of the public at the Commission's public document room at 1717 H Street NW., Washington, D.C. 20545. In addition, that report contains extensive references to background documents available to members of the public at the Commission's public document room.

The hearing will be conducted as informally and as expeditiously as practicable, consistent with affording the participants a reasonable opportunity to present their positions. Those participating in the hearing may, but need not be, represented by counsel.

Relevant written statements may be received for the record and those participating may, depending upon the number of requests received and the time available, be permitted to make brief oral statements of their views either in addition to, or in lieu of, written submissions. Persons making oral statements will not be sworn. Such persons, however, as well as persons offering written submissions at the hearing, will be subject to questioning by the presiding hearing board. All written comments and suggestions received pursuant to the invitation therefor set forth in the November 15, 1972, notice will be incorporated in the record of the proceeding.

The hearing board is authorized to take all necessary and appropriate action to control the course of the hearing, including, among other things, the holding of one or more procedural planning sessions. A transcript of the hearing will be made, and a copy of the transcript, together with copies of all documents presented at the hearing, will be placed in the Commission's public document room, 1717 H Street NW., Washington, D.C., where they will be available for inspection by members of the public.

At the conclusion of the hearing the record will be held open for a period of 30 days during which time any person may file such supplementary written statements as may be deemed appropriate in light of the hearing record. After the 30-day period expires, the presiding hearing board, without rendering any decision or making any recommendation, will forward the transcript of the hearing to the Commission together with an identification of issues raised at the hearing. The Commission will carefully consider the transcript of the hearing and the comments and suggestions submitted pursuant to the November 15, 1972, notice as well as other relevant considerations and factors, and, after reaching its determination in the rule making proceeding, will cause an appropriate notice to be published in the FEDERAL REGISTER.

(Sec. 161, 68 Stat. 948; sec. 102, 83 Stat. 853; 42 U.S.C. 2201, 4332)

Dated at Washington, D.C., this 27th day of December 1972.

For the Atomic Energy Commission.

PAUL C. BENDER,
Secretary of the Commission.

[FR Doc. 73-123 Filed 1-2-73; 8:45 am]

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF AMENDMENT OF 10 CFR PART 50 — LICENSING OF PRODUCTION AND UTILIZATION FACILITIES (Environmental Effects of the Uranium Fuel Cycle)	DOCKET NO. RM 50-3

REPORT TO THE COMMISSION BY THE NUCLEAR FUEL CYCLE HEARING BOARD

Pursuant to the Commission's directive in its Supplementary Notice of December 27, 1972 herein, the Nuclear Fuel Cycle Hearing Board forwards herewith to the Commission a report of the proceedings conducted, together with the record of the proceedings and an identification of the issues raised therein.

For the convenient reference of the Commission, there is set forth below a summary of the procedural course of the proceeding.

By Notice of Proposed Rulemaking published in the Federal Register on November 15, 1972 (37 F.R. 24191), the Commission announced a proposal to consider possible amendments to Part 50, Appendix D of its Rules which would deal specifically with the question of consideration of environmental effects associated with the Uranium Fuel Cycle in the individual cost-benefit analyses for light water-cooled power reactors. In conjunction with this Rule-

making, the Commission's Regulatory Staff, at the same time, issued for comment an Environmental Survey of the effects associated with producing the annual requirements for uranium nuclear fuel of a "model" light water-cooled power reactor capable of producing 1000 megawatts of electricity. The Environmental Survey, which was to serve as the basis for the Rulemaking Hearing, describes the effect of each stage of the cycle, from the mining and milling of natural uranium to the ultimate disposal of high level radioactive waste resulting from reprocessing of the used fuel. The Notice of Rulemaking invited the written comments of interested persons, to be filed by January 15, 1973, and scheduled an informal Rulemaking Hearing to be held on February 1, 1973, to permit the presentation of views, both oral and written, on two alternative approaches to consideration of the environmental effects of the Uranium Fuel Cycle in environmental statements, in terms of possible amendments to Part 50. The alternatives were set out in the Commission's Notice of November 15.[1]

Thereafter, in a Supplemental Notice of Rulemaking issued on December 27, 1972, the Commission set forth the procedural conditions which were to be followed in this informal, legislative-type rulemaking hearing. It was specified, among other things, that, since this would be part of a rulemaking rather than an adjudicatory proceeding, the provisions of Subpart G, "Rules of General Applicability",

[1] It should be noted that the language of Alternative (1) was amended on the record with a letter dated January 22, 1973, from Mr. Murray of the Regulatory Staff, in the following respects: the language to be amended appears in the right hand column of Page 24192 of the Federal Register of November 15, 1972, and concerns the revision of language in the penultimate sentence in Paragraph (1). The latter part of that sentence, as amended, is to read "activities as related to a particular light water-cooled nuclear power reactor have been analyzed in the Commission's 'Environmental Survey of the Nuclear Fuel Cycle' and if factored into the cost-benefit analysis, would be sufficiently small as not to affect significantly the resultant conclusion". (Tr. 53-54)

of Part 2 of the Commission's Rules of Practice would not be applicable and that no discovery or cross-examination would be utilized. However, the Notice provided that the participants in the hearing would be subject to questioning by the presiding Hearing Board.

On January 17, 1973, and pursuant to the authorization in the Supplemental Notice, the Hearing Board named by the Commission conducted a Procedure Planning Session to which all participants in this proceeding were invited. As a result of that session, a Further Notice of Rulemaking Hearing was issued by the Hearing Board on January 19, 1973, setting forth the schedule of appearances for participants who were to make oral presentations in addition to written submissions, and a statement of the understandings and agreements expressed by the participants at that session. There was attached to that Further Notice of Hearing a list of names and addresses of all the participants who had filed statements in this proceeding, and it was agreed by those present that the written submissions to be offered by the participants would be provided to the other participants in the proceeding named on the list.

The oral hearing commenced at 9:00 a.m. on the morning of February 1, 1973, and was completed in the afternoon of the next day, during which time oral presentations were made by members of the Regulatory Staff, a representative of the Environmental Protection Administration, and twelve other participants representing the industry, citizens groups, various State Agencies and individual citizens requesting to be heard. The Hearing Board incorporated by reference in the record of the proceeding, as though they had been set forth at length, certain pertinent documents in the proceeding, namely, the Commission's Notice of Proposed Rulemaking published in the Federal Register on November 15, 1972, the Environmental Survey of the

Nuclear Fuel Cycle issued by the Regulatory Staff of the Commission, the Commission's Supplemental Notice of Rulemaking Hearing issued December 27, 1972, and the Further Notice of Rulemaking Hearing issued by the Hearing Board on January 19, 1973. Questioning of the participants was conducted by members of the Hearing Board and further explanatory and supplementary written materials were requested and furnished by the various participants. Each of the participants was given all the time he had requested for his oral presentation and was afforded full opportunity to submit information and data for the record. A list of the participants submitting appearances, statements and written comments is attached hereto as *Appendix A*, and a list of persons making presentations at the oral hearing is attached as *Appendix B*.

During the course of the proceeding, it developed that one of the principal participants, Consolidated National Intervenors and Union of Concerned Scientists (CNI/UCS), intended to submit an extensive written document dealing with its comments and objections to the legal procedure being followed by the Commission in this proceeding and its comments on the sufficiency of the technical data in the Environmental Survey issued by the Regulatory Staff. It had indicated that its "final CNI/UCS report" would not be filed until the end of the 30-day post-hearing period, i.e., on or before March 4, 1973. Thereafter, CNI/UCS requested an extension of time until March 19th to file its "report". By Further Notice of Hearing dated February 16, 1973, the Hearing Board declared that the oral hearing was to be regarded as concluded as of February 16, 1973, and that the record was to remain open until and including March 19th, during which time any person could file such supplementary written statements as might be deemed appropriate in the light of the hearing record (in accord-

ance with the Commission's Supplementary Notice of December 27, 1972).

In response to the Motion for Extension of Time by CNI/UCS, the Board by Order of March 7, 1973, extended the time for CNI/UCS to file its statement on or before March 19th and permitted all participants other than CNI/UCS to be given a period of 7 days from March 19th within which to review the CNI/UCS filing to determine whether they wished to respond thereto and, if so, to request additional time therefor. Upon request, the Board granted several of the other participants extensions of time until April 16, 1973, to respond to the CNI/UCS Supplementary Comments.

The supplementary written submissions by the various participants were filed, respectively, on or before March 19th and the responses thereto on or before April 16, 1973, including the responses by the participants to the legal memorandum and technical comments filed by CNI/UCS. In its supplementary written statement, the Regulatory Staff also submitted a technical supplement entitled "Additional Information on Environmental Effects of the Uranium Fuel Cycle" which was designed, among other things, to respond to the questions raised by the Hearing Board and to the technical comments and questions of the other participants, and, accordingly, included revisions to the text and data of the original Environmental Survey.

With the foregoing documents, and the transcript of the Oral Hearing,[2] the record for this stage of the proceeding, to be submitted to the Commission, was completed.

[2] By separate Order of the Hearing Board, dated June 29, 1973, forwarded herewith, corrections to the transcript of the hearing, proposed by certain of the participants and those made by the Board, have been approved.

IDENTIFICATION OF ISSUES

As indicated above, the Commission directed the Hearing Board to forward to the Commission the record of this proceeding, together with an identification of the issues reflected by the hearing record. Accordingly, the Board submits the following description of the principal issues which it believes have emerged from these proceedings and which the Commission may wish to address in its consideration of the record.

1. The principal issue regarding the procedure used by the Commission on the instant rulemaking hearing was raised by CNI/UCS, who challenged the legality thereof.[3] At the oral hearing and its subsequent written submission, counsel for CNI/UCS argued, in substance, that in order for any rulemaking proceeding dealing with the Environmental Effects of the Nuclear Fuel Cycle on a "generic" basis to be legally valid, the procedures must be subject to the same adjudicatory hearing process which the Commission uses in the review of other technical safety and environmental issues, including the right of discovery and cross-examination. It contended that NEPA and the case law requires that the "environmental review" implicit in this rulemaking proceeding, which purports to replace the adjudicatory review conducted on the individual licensing case, must also be adjudicatory in nature.

In lieu of the two alternatives set forth in the Commission's Notice of Rulemaking, CNI/UCS suggested an "Alternative III", which would provide for an "on-going generic hearing", commencing with the preparation and circulation by the Staff of an environmental impact statement

[3] The comments filed by National Resources Defense Council, Inc. also contended that the commission's procedures herein did not comply with the requirements of NEPA.

of the fuel cycle. Parties to individual license hearings would participate in the rulemaking proceedings, which would be fully adjudicatory in nature and which would be heard before a designated Hearing Board. The "findings" of the Hearing Board at the conclusion thereof would then be incorporated into the record of the individual license hearings, subject, however, to challenge at the license hearing upon "a showing of good cause". CNI/UCS's proposed rule also contemplates that this generic hearing will be reopened and updated periodically as the advances in technology require revision of the impact statement, and that opportunity for adjudicatory hearings would be provided. New or modified findings by the Hearing Board would then be applied in the individual hearings.

The position of CNI/UCS as to the procedural requirements of the rulemaking proceeding was challenged in the responses and legal memoranda submitted by the Regulatory Staff, the utility companies represented by LeBoeuf, Lamb, Leiby & MacRae, (Alabama Power, et al), and the "14-Member Utility Group" represented by Hunton, Williams, Gay & Gibson. Citing extensive case law, it was the position of these participants that CNI/UCS was in error; that the AEC had adequate legal authority to formulate its regulatory policy in this area through the procedure of rulemaking; that adjudicatory processes are not required merely because the effect of the rulemaking would be to limit the issues which might otherwise be raised in a subsequent license proceeding; that the cases hold that the burden is on CNI to demonstrate that exceptional circumstances exist which require that adjudicatory processes be afforded in this rulemaking proceeding; and that no such showing has been made, nor have valid factual issues been raised which would call for the use of formal adjudicatory procedures.

The issue is thus presented for the Commission's consideration:

> Whether the Commission can validly promulgate regulations concerning the environmental effects of the Nuclear Fuel Cycle, to be used in subsequent individual nuclear power plant license hearings, by employing the notice and comment rulemaking procedures provided for in the Administrative Procedure Act, supplemented by oral presentations, questioning by a Hearing Board, and additional written submissions, comments and legal memoranda; or whether such rulemaking proceedings must be conducted with the full formal adjudicatory processes.

2. The record of the hearings contains reference by the participants to various omissions, inconsistencies and alleged errors of fact in the Environmental Survey issued by the Directorate of Licensing.[4] Further, the record of the hearing reveals that questions were raised as to the omission of any treatment in the Survey of the factors of safeguards against sabotage or possible diversion of nuclear materials, details of transportation, long-term environmental effects, selected aspects of mining and milling operations, details of various shipping operations, plutonium handling and others. A further example of alleged omissions from the Survey concerns the handling of plutonium isolated by the reprocessing plant[5] which is also included in references to the omission of "plutonium recycle" considerations.[6]

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[4] See, for example, comments by AIF (2/2/73, Tr. p. 397 ff), Dep. Commerce (2/17/73), Consumers Power (1/11/73), Duke (1/12/73), Edlow (1/11/73), EPA (1/19/73, 2/1/73), GE (1/26/73, 3/1/73), Dep. Interior (2/23/73), NRDC (3/19/73), NY Dep. Env. Cons (1/18/73), Sierra Club (1/24/73), Tr. p. 190 ff, and others.

[5] Tr. p. 130-135, Duke Power (1/12/73), NRDC (3/19/73) and others.

[6] See, for example, submissions by AIF (Tr. p. 397 ff), Cons. Pwr (1/11/73), EEI (1/30/73), Sierra Club (1/24/73), and others.

At the time the Environmental Survey was issued for public comment in the Rulemaking Proceeding, together with the proposed amendments to the Rules, the Survey did not contain data with regard to proposed waste disposal systems. During the course of the oral presentation, the Regulatory Staff offered for the record an extensive presentation by Dr. Frank Pittman regarding various methods for waste disposal which were in the planning stage, and, based upon such planning, assigned various values regarding assumed environmental impact of such waste storage facilities. It was argued that, in all other respects, the Survey dealt with the environmental impact of actual and existing facilities; but that, with respect to waste disposal, the Survey was unreliable in that it dealt with non-existent facilities; and that the proposed Table S-3 in Alternative II did not take into account any of the data regarding waste disposal contained in Dr. Pittman's later presentation.

Finally, some of the participants contended that various alleged deficiencies in the Survey precluded them from full opportunity to explore and comment on the bases for the conclusions in the Survey and, hence, its substance.[7] The Regulatory Staff indicated, during the course of the proceeding and in its supplemental written submissions, that it intends to issue a substantially revised Environmental Survey in the light of the testimony and written comments submitted for the record in this proceeding, and to add to the Survey the Pittman presentation.

In light of the foregoing, the following issues are presented for the Commission's consideration:

Whether, in light of the comments and questions raised in this record as to the present technical adequacy of the

[7] See, for example, CNI (1/29/73, p. 10-11), NRDC (3/19/73). Sierra Club (1/24/73), Tr. p. 161 ff, and others.

Survey, a substantial revision of the Environmental Survey should be prepared and issued by the Commission prior to the final adoption of regulations amending Part 50 of the Rules.

Whether the Administrative Procedure Act requires the reopening of the proceeding to permit comment on the revised Survey which will probably contain, *inter alia*, the revisions in light of the record thus far made, the revised data regarding waste disposal, an amended Table S-3, and the concurrent Pittman presentation on waste disposal.

Whether such further Rulemaking Proceeding on the revised Environmental Survey should be a full proceeding of oral and written testimony and comment, in the manner conducted in the original Rulemaking Proceeding, in which comment will be invited on all aspects of the Nuclear Fuel Cycle; or whether the further proceeding should be limited to oral and written comment on merely the revisions to the Environmental Survey.

3. The record indicates the concern of a number of the participants as to the use in the Survey of qualitatively styled and allegedly undefined descriptive phrases as a basis for conclusions regarding the magnitude of the environmental impact.[8] These deficiencies are alleged to have hindered full and inclusive examination of the bases for the salient conclusions of the Survey.

In the light of these comments on the record of the Proceeding, issues appear to be raised in the following respects:

Whether the Survey should be revised to provide more precise definition of the magnitude and anticipated ranges

[8] See, for example, CNI (1/29/73, 3/19/73), AEC (3/19/73, Part I, p. 21), Cons. Pwr. (1/11/73), EPA (1/19/73), AIF (2/2/73 and Tr. p. 397 ff), NRDC (3/19/73), Tr. p. 138 ff, and others.

of variables pertinent to an assessment of the environmental impact, so that the Survey will be available for the broadest generic application, will meet minimum standards for technical soundness and will remain valid for an appreciable length of time.

Whether more extensive analyses of the long-term environmental effects of, among others, waste storage and/or disposal are required to sustain the validity of the conclusions reached in the Survey.

Whether the methodology employed in the preparation of the Survey — i.e. averaging of environmental effects and the use of models for each fuel cycle step — produced values sufficiently conservative to warrant conclusions indicated therein regarding negligible environmental impact.

4. The record indicates that the adequacy of the Survey's information may, at best, be limited to a few years from the date of issue.[9] Consequently, suggestions for revision and reexamination of the Survey at intervals have been presented in the record. These proposals by the participants and the Regulatory Staff raise an issue for resolution by the Commission in the following terms:

> Whether the Commission should indicate in its Report adopting Regulations that the Environmental Survey would have a stated limited term of applicability and that the Regulations adopted would, by their terms, provide for periodic reexamination and revision; and, if so, what would be the length of such term.

5. A number of the comments in the record referred to the impact of a Commission determination in this Rule-

[9] See, for example, EPA (1/19/73 and Tr. p. 153 ff), GE (1/26/73), AEC (3/19/73), Tr. p. 463 ff, and others.

making Proceeding upon pending licensing cases. It is noted that the Commission specifically referred to the matter in its Notice of Rulemaking of November 15, 1972 herein (37 F.R. 24192-3). It was argued, *inter alia,* that in order to avoid disruption of the pending licensing proceedings, the rule ultimately adopted should spell out clearly the circumstances under which it would be applicable to pending cases.[10] This proposal presents a question as to:

> Whether the Commission should, in the promulgation and implementation of any regulations governing the environmental impact of the Uranium Fuel Cycle, make provision for exemption or limited applicability thereof insofar as pending licensing cases are concerned.

6. Various parties, in their testimony and written comment, posed questions concerning the feasibility and sufficiency of the "Alternatives" (I and II) presented in the Commission's Notice of Rulemaking. The comments of the participants included (a) outright endorsement of the "generic" approach contemplated by the two proposed Alternatives and acceptance of either in their then expressed terms, (b) preferences for one or the other with reasons therefor, (c) proposals for modification of Alternative II, principally, and (d) advocacy of substitute "Alternatives" with a radically different approach (i.e., environmental impact statements, adjudicatory hearings, periodic updating hearings, etc.).

In light of the foregoing, the issue raised for consideration by the Commission is:

> Whether the Commission should reexamine the proposed "Alternatives", in the light of the record in the Proceed-

[10] See, for example, GE (1/26/73), Cons. Pwr. (1/11/73), CNI (3/2/73), AIF (2/2/73), "14 Member Utility Group", (1/15/73), p. 8, n. 9), AIF, Tr. 430-31.

ing to determine what modifications, if any, it wishes to make in its approach to a generic determination of the environmental effects of the nuclear fuel cycle.

7. The record indicates that some of the participants in the Proceeding raised questions as to the use of the descriptions of the various plants in the "typical" fuel cycle, as analyzed in the Survey as a basis for the development of a generic environmental statement.[11] The question was raised as to whether the values thus developed, being for the purpose of obtaining a generic assessment of the environmental impact, would be used in connection with license conditions and limitations. The record would appear to raise the following question:

> Whether the Commission's Report should make clear that the "model approach" used in the preparation of the Environmental Survey, and the values attendant thereto, constitute descriptive information only, and are not intended as operating limits which may be imposed in licensing and regulatory actions on various commercial plants which constitute part of the Nuclear Fuel Cycle.

8. Two other items arose during the course of the proceeding which the Board feels would merit the attention of the Commission:

(a) The record contains reference by some of the participants as to the matter of availability of reference materials and calculations used by the Staff as the basis for various conclusions in the Survey. Questions were also raised by the Hearing Board as to the ready availability and intelligibility of such background information and reference calculations, so that the public would have an adequate opportunity

[11] See, for example, AIF (2/2/73 and Tr. p. 402, p. 435, p. 454), Tr. p. 146, and others.

to evaluate and comment upon the validity of the conclusions in the Survey. It would appear that this aspect of the proceeding might well be addressed by the Commission in terms of a directive to the Staff to assure that the background references, reference materials, and various calculations, which served as the basis for conclusions in the Survey, be made readily available and usable for the public, in a form which is fairly identifiable, so that the spirit of the Public Information Act may be satisfied and that the public can have a realistic opportunity to examine the background materials upon which proposed action is based.

(b) The assessment of environmental impact of the Nuclear Fuel Cycle has been based on the "model" provided in the Survey. In licensing proceedings, consideration of NEPA environmental issues requires a cost-benefit analysis which considers and balances the environmental effects of the facility and the alternatives available for reducing or avoiding adverse environmental effects. Hence, the question is raised whether the requirements of NEPA call for a discussion of alternative processes with regard to the Fuel Cycle operations (underground *vs.* strip mining, acid *vs.* alkaline milling, storage of liquid wastes *vs.* storage of solidified wastes, etc.).

The foregoing constitutes the Report of the Hearing Board in this proceeding, as directed by the Commission.

Respectfully Submitted,

THE NUCLEAR FUEL CYCLE
HEARING BOARD

JOHN C. GEYER, Member
MARTIN J. STEINDLER, Member
MAX D. PAGLIN, Chairman

Issued at Washington, D. C.,
this 6th day of July, 1973.

APPENDIX A

DOCKET NO. RM 50-3

PARTICIPANTS SUBMITTING APPEARANCES, STATEMENTS AND WRITTEN COMMENTS

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CHAPTER I — ATOMIC ENERGY COMMISSION
PART 50 — LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

Environmental Effects of the Uranium Fuel Cycle

On November 15, 1972, the Atomic Energy Commission published in the FEDERAL REGISTER a notice of consideration of possible amendments to Appendix D, Interim Statement of General Policy and Procedure: Implementation of the National Environmental Policy Act, 10 CFR Part 50, Licensing of Production and Utilization Facilities (37 FR 24191). The amendments proposed here supplement our established rules for fulfilling section 102(2)(C) procedures of NEPA. The amendments address the question whether to consider the environmental effects associated with the uranium fuel cycle in the individual cost-benefit analyses for light-water-cooled nuclear power reactors. The Atomic Safety and Licensing Appeal Board had earlier held that some such effects should be considered while others should not.[1]

The proposed amendments set forth two alternative approaches to considering the environmental effects associated with the uranium fuel cycle. Under the first, such environmental effects would not have to be considered in applicants' environmental reports and Commission detailed statements of environmental considerations since, if factored into individual cost-benefit analyses, they would be sufficiently small as not to affect significantly the resultant conclusion. Under the second alternative, the environmental effect as-

[1] Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-56, ALAB-73 (June 6, 1972 and October 11, 1972).

sociated with the uranium fuel cycle, albeit small, would be factored into individual cost-benefit analyses in the form of numerical values derived from the instant proceeding. The second alternative has been adopted by the Commission as an effective rule, with certain clarifying and editorial changes. Insofar as this rule differs from the Appeal Board decisions in "Vermont Yankee" supra, those decisions have no further precedential significance. The Commission also notes that adoption of this amendment is without prejudice to consideration of whether or not a full generic environmental impact statement on the uranium fuel cycle should be issued pursuant to 10 CFR Parts 11 and 51 of the Commission's regulations.

The FEDERAL REGISTER notice announced the availability for comment of the "Environmental Survey of the Nuclear Fuel Cycle," dated November 1972, prepared by the Commission's Regulatory staff. This document was designed to serve as a primary data base for the proposed amendment and not as an analysis of alternatives and costs and benefits of the entire uranium fuel cycle. Indeed, certain portions of that overall fuel cycle are undergoing separate examination and are not involved in this proceeding. These include: (i) An environmental statement in support of a recommendation by the General Manager to continue the present program for developing Federal repositories for commercial high level wastes (38 FR 29350), and (ii) a separate rule making proceeding examining transportation of UO_2 fuel to and from light water reactors and transportation of solid wastes from such reactors to waste burial grounds (38 FR 3334).

In addition, another fuel cycle for light water reactors is under study by the staff. Typical programs underway on this subject include: (i) Preparation of a generic environmental impact statement concerning potential programs for

recycling plutonium in commercial light-water reactors (39 FR 5536), (ii) analysis of methods for disposal of wastes contaminated with plutonium, and (iii) an environmental analysis of the proposed amendment to 10 CFR 71 that would require significant quantities of plutonium to be shipped as a solid in packages providing at least double containment (38 FR 20482).

The survey described stages of the fuel cycle for the purpose of determining whether the cost-benefit analysis required by NEPA and our regulation (10 CFR Part 50, Appendix D) for environmental impact studies in licensing proceedings should include numbers quantifying effects of the uranium fuel cycle. The purpose of this proceeding was to make determinations as to whether certain elements should be factored into impact statements to be utilized in other proceedings; the purpose was not to undertake a full environmental review of the uranium fuel cycle. In short, this proceeding addresses a procedural question involving the implementation of NEPA's requirement for cost-benefit analyses in impact studies. For this reason, no environmental impact statement has been prepared in connection with the rule adopted today.

All interested persons were invited to submit written comments and suggestions in connection with the proposed amendments and the Environmental Survey within 60 days after publication of the notice in the FEDERAL REGISTER. In addition, an informal rule making hearing was held on February 1, 1973, to permit the presentation of written and oral views on the Environmental Survey and the alternative approaches to consideration of the environmental effects associated with the uranium fuel cycle.

On January 3, 1973, the Commission issued a Supplemental Notice setting forth the procedures which were to

be followed in the informal rule making hearing (38 FR 50). The notice stated, among other things, that since the hearing would be part of a rule making rather than an adjudicatory proceeding, the provisions of Subpart G, Rules of General Applicability, of Part 2 of the Commission's rules of practice would not be applicable and that, therefore, such procedural features as discovery and cross-examination would not be utilized. The notice provided, however, that the participants in the hearing would be subject to questioning by the presiding hearing board. The notice further provided that at the conclusion of the hearing, the record was to be held open for a period of 30 days during which time any person could file supplementary written comments deemed appropriate in light of the hearing record. After the expiration of the 30-day period, the presiding hearing board, without rendering any decision or making any recommendation, was to forward the hearing transcript to the Commission together with an identification of issues raised at the hearing.

Written comments were received from 46 individuals and organizations representing Federal and State agencies, industry, public utilities, environmental and citizen groups, and private citizens. Participants in the informal rule making hearing included the Commission's Regulatory staff; the Environmental Protection Agency; the Mapleton Intervenors of Midland, Michigan; Westinghouse Electric Corporation; Consolidated National Intervenors and the Union of Concerned Scientists, jointly; the Atomic Industrial Forum; the Consolidated Utilities, composed of fourteen utilities appearing jointly; the New York State Department of Environmental Conservation; and the Minnesota Pollution Control Agency. In addition, two individual members of the public made limited appearances.

In its "Report to the Commission by the Nuclear Fuel Cycle Hearing Board," submitted on July 6, 1973, pursuant

to a Supplemental Notice of Hearing published on January 3, 1973, the presiding hearing board identified a number of issues which it believed were raised at the hearing and in the written comments. The first issue identified concerned a challenge by CNI/UCS to the procedures used by the Commission for the hearing. That participant argued that for any rulemaking hearing dealing with the environmental effects of the nuclear fuel cycle on a generic basis to be legally valid, the hearing must incorporate the same adjudicatory procedural features used in individual production and utilization facility licensing proceedings, including the rights of discovery and cross-examination. On the basis of this contention, the participant recommended adoption of a "third alternative" which would provide for an "on-going generic hearing" requiring preparation and circulation of an environmental impact statement. Under this alternative, parties to individual reactor licensing proceedings would be permitted to participate in an "adjudicatory" rule making proceeding, the findings of which would be incorporated into the record of individual licensing hearings.

The Commission has considered this challenge to the legal validity of the present rule making proceeding and the arguments in opposition which were filed by other parties. In our view, the procedures adopted provide a more than adequate basis for formulation of the rule we adopted. All parties were fully heard. Nothing offered was excluded. The record does not indicate that any evidentiary material would have been received under different procedures. Nor did the proponent of the strict "adjudicatory" approach make an offer of proof — or even remotely suggest — what substantive matters it would develop under different procedures. In addition, we note that all documents including the Survey were available to the parties several weeks be-

fore the hearing, and the Regulatory staff, though not requested to do so, made available various drafts and handwritten notes.[2] Under all of the circumstances, we conclude that adjudicatory type procedures were not warranted here.

The second area in which issues were identified by the presiding hearing board related to the scope and depth of the underlying Environmental Survey. One issue was whether, in light of the comments in the record, substantial revision of the survey should be made prior to adoption of a final rule. Also identified was the issue of whether the Administrative Procedure Act requires reopening of the proceeding to permit comment on any revised survey and whether such reopened proceeding should be made a proceeding conducted in the manner of the original proceeding in which comment would be invited on all aspects of the nuclear fuel cycle; or whether such proceeding should be limited to comment only on the revisions to the Survey.

In discussing the issues in this area, the presiding hearing board mentioned, among other things, the factors of safeguards against sabotage and diversion of nuclear materials and plutonium handling. The board also indicated that arguments had been advanced that the Survey was unreliable with respect to high level waste disposal in that facilities for such disposal are presently non-existent.

Sabotage and diversion receive considerable attention in licensing of individual fuel cycle facilities. The issuance of any special nuclear material license involving significant quantities of such material is contingent upon a finding by the AEC that the required accountability and physical se-

[2] Some or all of these items might not have been provided under rigid adjudicatory rules. For example, on the one occasion when CNI/UCS requested a specific document, it was promptly made available, even though it was an internal staff memorandum written for the Commissioners themselves.

curity systems are adequate to provide reasonable protection against acts of sabotage and diversion of materials. Beyond this, insofar as environmental impact is concerned, sabotage and diversion may be viewed in the context of possible contributing factors, among others, to accident conditions. The Environmental Survey does, in fact, consider a number of postulated accidents and their environmental effects. The postulated accidents thus considered in the Survey are deemed to be a reasonable representation of the environmental effects that could result from the more credible acts of sabotage.

Those aspects of the uranium fuel cycle which involve plutonium handling, namely recovery and storage, were described in the Environmental Survey. However, other forms of plutonium handling were not discussed in the survey because the survey is applicable only to light-water-power reactors using conventional uranium dioxide fuel. Reactors utilizing plutonium recycle fuel fall outside the Survey's scope of coverage and, therefore, the values in the Summary Table are inapplicable. As stated earlier, however, the Commission is presently drafting an environmental impact statement covering all aspects of the full-scale use of plutonium in light-water reactors, including the fuel cycle.

Considerable information was presented at the hearing on high level waste storage, utilizing a retrievable surface storage facility. A description was given of such facility, the normal radiological effluents, and a maximum credible accident. The estimated normal annual radiological release was 0.005 curies. Although the ultimate capacity of the facility would be about 80,000 canisters of waste, corresponding to about 8,000 annual fuel requirements (AFR), the initial capacity will be substantially less. Even if one assumed that the annual release from the facility were associated with a single annual fuel requirement, the fission

product release per annual fuel requirement would be 0.005 Ci/AFR. Since the release of solid fission products and actinides from the model reprocessing plant is estimated at 1.004 Ci/AFR, the omission of waste repository effluents from the original Environmental Survey did not materially affect the releases shown in the Summary Table. However, the 0.005 Ci/AFR value has been added to the 1.004 Ci/AFR value in the Summary Table for a combined total, when rounded off, of 1.01 Ci/AFR. While such a waste storage facility has not been constructed, preliminary conceptual designs have been developed using existing technology based on well established data and techniques.

The Commission believes that the Survey and hearing record provide an adequate data base for the regulation adopted. Revisions to the chemical effluents in Table S-3 have been made to reflect corrections or suggestions entered into the hearing record on UF_6 conversion facilities, UO_2 conversion plants and mining operations. Minor corrections with respect to radioactive effluents have been made and in no case do these corrections increase the effluent effects by more than .25 percent of natural background. To conform the table precisely to the text of the Survey, the values for iodine-129 and 131 releases have been changed from .002 and .02 curies to .0024 and .024 curies, respectively. In addition, values for exposure of workers and the general public in the transportation of radioactive materials covered in the Survey have been added to the Summary Table. To incorporate these changes, to incorporate data on the retrievable surface storage facility in high level wastes described in the hearing, and to add information suggested in comments received as a part of the hearing record, the Environmental Survey has been revised and is being issued in revised form concurrently with promulgation of this

amendment.[3] In view of the fact that these revisions are minor and reflect the record already developed, we see no occasion for reopening this proceeding.

A third area in which issues were identified by the presiding hearing board relates to the Environmental Survey's use of qualitatively styled and allegedly undefined descriptive phrases for its conclusions regarding the magnitude of the environmental impact. One issue is whether the Survey should be revised to define more precisely the magnitude and anticipated ranges of variables pertinent to an assessment of the environmental impact. The Summary Table, S-3, to be used as a basis for evaluating the environmental effects in a cost-benefit analysis for a reactor quantifies all releases, and relates maximum effects to recognizable standards where practical. The Commission believes that providing ranges of variables relevant to assessing environmental impact would serve little or no constructive purpose here since conservatism was utilized in deriving the Summary Table values, and thus, these values already reflect an environmental impact greater than that which is truly anticipated. In addition, developing a range of values would have required separate investigations of multiple factors at over 150 mines, some 19 mills, 2 conversion plants, 3 enrichment plants, and 10 fuel fabrication facilities — to arrive at a range of values augmenting numbers already reflecting substantial conservatism.

Another issue identified in this area is whether more extensive analyses of the long-term environmental effects of waste storage and disposal are necessary to sustain the validity of the conclusions in the Survey. The Commission

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[3] Among other things, the revised Survey refers to and gives excerpts from an analysis by the Environmental Protection Agency that show that the CNI/UCS analysis of the Nuclear Fuel Services operation does not accurately represent the most recent operating history of NFS.

believes that sufficient data were presented regarding engineered waste storage facilities to justify the conclusion that the contribution of waste storage and disposal to the total environmental impact of the fuel cycle is relatively insignificant. However, as more information on high level waste storage and disposal systems becomes available as a result of the environmental impact statement on high level waste storage referenced earlier, a more definitive assessment of the environmental impact can be undertaken and the Survey revised accordingly, as appropriate.

The third issue raised in this area is whether the averaging of environmental effects and the use of models for each fuel cycle step produced values sufficiently conservative to warrant the Survey's conclusion of negligible environmental impact. The "model" facilities defined for the Environmental Survey represent the true industry average for the UF_6 conversion, enrichment, and reprocessing portions of the fuel cycle. The model mill size chosen is near the upper range of mill sizes, and the major environmental effects from milling result from the airborne effluents and tailings waste disposal steps common to all mills. Choosing a relatively large mill as a basis tended to make local environmental effects large, and hence conservative. The fuel fabrication model plant is typical of two plants that produce about 60 percent of the fuel manufactured in the United States today and conservatively represents the remainder. The effluents from the model facility were estimated without taking credit for recently installed pollution-abatement equipment and the distance from the plant to the near site boundary of the model represents the smallest distance of any actual fuel fabrication plant. These model and effluent characteristics produce conservative estimates of environmental effects.

A fourth area in which the hearing board identified an issue relates to suggestions for revision and re-examination

of the Environmental Survey at periodic intervals. While the Commission agrees with the suggestions that the Survey be re-examined from time to time to appropriately accommodate new technology and information, it does not believe it necessary or advisable to impose any specific time limit. In our view, revision should be based on growth in the data base, not on any fixed and arbitrary time period. Should future revisions to the Survey necessitate changes in the Summary Table, further rule making will be undertaken and the public afforded an opportunity for comment.

A fifth issue identified by the hearing board is whether any provision should be made for exempting or limiting the applicability of a final rule insofar as pending licensing cases are concerned. In view of the fact that the environmental effects of the uranium fuel cycle have been shown to be relatively insignificant, the Commission believes that it is unnecessary to apply the amendment to applicant's environmental reports submitted prior to its effective date or to Final Environmental Statements for which Draft Environmental Statements have been circulated for comment prior to the effective date. However, Draft Environmental Statements prepared but not circulated for comment prior to the effective date will be revised in accordance with the provisions of the amendment.

The sixth issue identified is whether the Commission should re-examine the proposed "Alternatives" in light of the record of the proceeding to determine whether modifications are necessary or desirable. In reviewing the record of the rule making hearing the Commission finds general approval for its generic approach to the consideration to be given to the environmental effects associated with the uranium fuel cycle. Many participants advocated adoption of one alternative or the other, other participants proposed modified versions of the alternatives, and one participant

advocated adoption of a third alternative which was discussed earlier. After examining these proposals, and after re-examining its own proposed alternatives, the Commission has adopted a slightly modified version of Alternative 2. The Commission, as did many of the hearing participants and commentators, favors the approach of Alternative 2 over that of Alternative 1 because the former conforms with the requirements of subsections 3 and 8 of section A of Appendix D to 10 CFR Part 50 in that it quantifies, to the fullest extent practicable, the environmental effects of the uranium fuel cycle in individual cost-benefit analyses. Incorporation of the Summary Table values into cost-benefit analyses in environmental reports and detailed statements will also help to assure more complete and meaningful documents. The changes in the effective amendment are clarifying and editorial in nature.

The seventh issue identified is whether further clarification is necessary to make clear that the Environmental Survey and the Summary Table of values are purely descriptive and are not intended as operating limits which may be imposed in licensing and regulatory actions with respect to the various fuel cycle facilities. Neither the effective amendment nor the Environmental Survey state or imply that the values in the Summary Table are to be imposed as operating limits on present and future fuel cycle facilities. Such limits are established and governed by other AEC regulations, principally, the provisions of Part 20 of Title 10 of the Code of Federal Regulations, "Standards for Protection Against Radiation." Further clarification is considered unnecessary.

The presiding hearing board raised two additional items which it believed merited Commission attention. The first was more in the nature of a suggestion to the Commission that the Regulatory staff be directed to assure the ready

availability of the background references, reference materials, and various calculations which served as the basis for the conclusions in the Survey. Copies of all non-copyrighted material, together with prior drafts of the Environmental Statement marked up by the staff, and over 100 pages of handwritten calculations were given to the Public Document Room on January 5, 1973. Therefore, the Commission believes that the staff had already complied with this suggested directive by making these background references, uncopyrighted reference materials, previous drafts and the various calculations available in the AEC's Public Document Room.

The second item referred to is whether the Environmental Survey should have discussed alternative processes with regard to fuel cycle operations. The purpose of the Survey was to provide a data base from which numerical values could be derived which would reflect the environmental impact associated with the uranium fuel cycle. These values would then be factored into cost-benefit analyses for individual reactors under the alternative adopted. Whenever possible, Survey data were based on actual operating fuel cycle facilities in order to produce numerical values reflecting real or actual environmental impact. Where this was not possible, conservatism was utilized. As stated earlier, the Environmental Survey is not an impact statement, and therefore, a discussion of alternatives is not required. In addition, the Commission does not believe that the Survey is the appropriate place to discuss alternatives in view of the fact that alternatives are considered in the NEPA context in individual licensing actions on fuel cycle facilities. On the basis of the foregoing and consideration of the comments received, the record of the hearing and other factors involved, the Commission has adopted the amendment set forth below. The amendment is essentially identical to the

second alternative contained in the November 15, 1972 FEDERAL REGISTER notice (37 FR 24191), except for minor clarifying and editorial changes.

Pursuant to the Atomic Energy Act of 1954, as amended, and sections 552 and 553 of Title 5 of the United States Code, the following amendment to Appendix D to 10 CFR Part 50 is published as a document subject to codification.

1. A new subsection 15 is added to section A to read as follows:

15. (a) In applicant's environmental reports and the Commission's detailed statements for light-water-cooled nuclear power reactors, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low level wastes and high level wastes related to uranium fuel cycle activities to the environmental costs of licensing the nuclear power reactor, shall be as set forth in the following Table S-3 of the Commission's "Environmental Survey of the Uranium Fuel Cycle." No further discussion of such environmental effects shall be required.

(b) This section does not apply to any applicant's environmental report submitted pursuant to section 4 prior to June 6, 1974, or to any Final Environmental Statement for which a Draft Environmental Statement had been circulated for comment prior to June 6, 1974.

Effective date. The foregoing amendment is effective on June 6, 1974.

(Sec. 161, Pub. L. 83-703, 68 Stat. 948; Sec. 102 Pub. Law 91-190, 83 Stat. 853; (42 U.S.C. 2201, 4332)).

Dated at Washington, D.C. this 16th day of April 1974.

For the Atomic Energy Commission.

PAUL C. BENDER,
Secretary of the Commission.

TABLE S-3. — *Summary of environmental considerations for uranium fuel cycle*

[Normalised to model LWR annual fuel requirement]

Natural resource use	Total	Maximum effect per annual fuel requirement of model 1,000 MWe LWR
Land (acres):		
Temporarily committed	63	
Undisturbed area	45	
Disturbed area	18	Equivalent to 90 MWe coal-fired powerplant.
Permanently committed	4.6	
Overburden moved (millions of MT)	2.7	Equivalent to 90 MWe coal-fired powerplant.
Water (millions of gallons):		
Discharged to air	156	[illegible] percent model 1,000 MWe LWR with cooling tower.
Discharged to water bodies	11,040	
Discharged to ground	123	
Total	11,319	<4 percent of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousands of MW-hour)	317	<4 percent of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT)	118	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	92	<0.2 percent of model 1,000 MWe energy output.
Effluents—chemical (MT):		
Gases (including entrainment):[1]		
SO_x	4,400	
NO_x[2]	1,177	Equivalent to emissions from 45 MWe coal-fired plant for a year.
Hydrocarbons	13.5	
CO	28.7	
Particulates	1,156	
Other gases:		
F-	.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards—below level that has effects on human health.
Liquids:		
SO_4=	10.3	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constitutents that require dilution and the flow of dilution water are: NH_3—600 cfs. NO_3—20 cfs. Fluoride—70 cfs.
NO_3-	26.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl-	8.6	
Na^+	16.9	
NH	11.5	
Fe_3	.4	
Tailings solutions (thousands of MT)	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—Radiological (curies):		
Gases (including entrainment):		
Rn-222	75	Principally from mills—maximum annual dose rate <4 percent of average natural background within 5 mi of mill. Results in 0.06 man-rem per annual fuel requirement.
Ra-226	.03	
Th-230	.02	
Uranium	.032	
Tritium (thousand)	16.7	Principally from fuel reprocessing plants—Whole body dose is 6 man-rem per annual fuel requirement for population within 50 mi radius. This is <0.005 percent of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/yr has been included in fission products and transuranics total.
Kr-85 (thousands)	350	
I-129	.0024	
I-131	.024	
Fission products and transuranics	1.01	
Liquids:		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production-concentration 5 percent of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Ru-106[3]	.15	From reprocessing plants—maximum concentration 4 percent of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (thousands)	2.5	
Solids (buried):		
Other than high level	601	All except 1 Ci comes from mills—included in tailings returned to ground—no significant effluent to the environment, 1 Ci from conversion and fuel fabrication is buried.
Thermal (billions)	3,360	<7 percent of model 1,000 MWe LWR.
Transportation (man-rem): Exposure of workers and general public	.334	

[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.3 percent from natural gas use and process.
[3] Cs-137 (0.075 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

(FR Doc. 74-9076 Filed 4-19-74; 8:45 am)

Supreme Court, U. S.
FILED
JUN 2 1977
MICHAEL RODAK, JR., CLERK

APPENDIX

VOLUME II

PAGES 401 - 1396

IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.,

Respondents

No. 76-528

CONSUMERS POWER COMPANY,

Petitioner

v.

NELSON AESCHLIMAN, ET AL.,

Respondents

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

PETITIONS FOR WRITS OF CERTIORARI FILED
SEPTEMBER 21 AND OCTOBER 14, 1976
CERTIORARI GRANTED FEBRUARY 22, 1977

[SUMMARY OF APPLICATION

VERMONT YANKEE NUCLEAR POWER STATION
Ex. 3, pp. 2-5, AEC Dkt. No. 50-271]

SITE AND ENVIRONS

The site for the Vermont Yankee Nuclear Power Station is located in the town of Vernon, Vermont in Windham County on the west shore of the Connecticut River upstream of the Vernon Hydroelectric Station. The site consists of about 125 acres owned by the Vermont Yankee Nuclear Power Corporation and a narrow strip of land owned by New England Power Company and located between the Connecticut River and the boundary of the Vermont Yankee property and in which Vermont Yankee has perpetual rights and easements granted by the New England Power Company with the approval of the Federal Power Commission. The City of Brattleboro, Vermont is about five miles upstream of the site. There are no residences on the site, and the minimum distance from the reactor building to the boundary of the exclusion zone, as defined in 10 CFR 100, is 910 feet. The nearest town with a population of 25,000 or greater is Northampton, Massachusetts, about 30 miles to the south. Much of the land around the site is undeveloped. Most of the developed land is used for agriculture and dairying, with houses scattered or grouped in small villages. Appendix B appended hereto is a map showing the location of the site with respect to adjacent areas (FSAR 2.2).

In July 1969 Vermont Yankee initiated a comprehensive environmental radiation surveillance program designed to monitor the atmospheric, terrestrial and aquatic environments in the vicinity of the station. This program was developed in cooperation with the Vermont State Department of Health and reviewed by the Vermont Water Resources Board.

It is Vermont Yankee's intent that the environmental surveillance program will be closely coordinated with conditions of station operation by systematically correlating information developed through continuous in-plant monitoring, effluent release records and environmental sample collection and analysis. The primary purpose of the surveillance program is to make station management and the State Health Department aware of any conditions of station operation which may have a significant effect on the environment. The operational surveillance program will be a graded program subject to periodic critical review (FSAR 2.6).

Plant Design Bases Dependent Upon Plant Site and Environs Characteristics

Information relating to the site and environs for the Vermont Yankee Nuclear Power Station is presented in Section 2 of the FSAR. The design features which were dependent or affected by the site characteristics are summarized below.

Condenser Off-Gas System

The condenser off-gases will be discharged to the atmosphere through decay piping and a stack 308 feet above grade. The off-gas system is used during normal operation. It is expected that the release of gaseous radioactivity will be kept within small fractions of the limits specified in 10 CFR 20 based on the use of the off-gas system. However, to further minimize the release of gaseous radioactive wastes, Vermont Yankee will modify the off-gas system to provide additional holdup and subsequent decay of air ejector off-gases. The design of this advanced off-gas system is currently underway and fabrication and installation

will be completed by the end of the first refueling outage (FSAR 9.4 and Appendix E).

Liquid Waste Effluents

Liquid effluents will be released from the radwaste dilution system at a point downstream of the aeration blocks in the station discharge structure. The liquid waste treatment system has been designed so that those liquid effluents which are released from the station are always well within the limits specified in 10 CFR 20. This is a batch-type system wherein the wastes are separately collected and processed based upon the most efficient methods. Batches of liquid radwaste are sampled and analyzed prior to discharge. If suitable for discharge, radwaste effluents are released at a rate such that the resultant concentration at the point of release will never exceed 10 CFR 20 nor the applicable state release limit. During each release, a continuous radiation monitoring device is set to alarm upon excessive activity concentration in the radwaste discharge line. Discharge records are maintained for all station liquid radwaste effluents.

Wind Loading Design

Plant structures are designed to withstand the effects of 80 mph winds with gusts to 110 mph. Although the probability of a tornado occurring at the Vermont Yankee site is small, all structures and equipment necessary to initiate and maintain a safe plant shutdown are designed to withstand a tornado wind loading of 300 mph (FSAR 2.3 and 12.2).

Hydrology

The site is at mile 138.3 above the mouth of the Connecticut River on the west bank on the pond formed by the

Vernon Dam and Hydroelectric Station. The maximum recorded water level at Vernon was 231.4 feet mean sea level which occurred during the flood of March 19, 1936. The minimum elevation of access openings to buildings housing important equipment is 252.5 feet mean sea level, more than 20 feet above the maximum observed water level. An analysis of water levels resulting from the probable maximum flood, a postulated occurrence which is more severe than the most significant historical event, has been performed and shows that the station is suitably protected against the maximum probable flood (FSAR 2.4 and Appendix I).

Geology

The site area is overlaid by glacial deposits, with an average of 30 feet of glacial overburden above the local bedrock. Major structures of the station, including the reactor building and turbine building, are supported on rock. Seismic velocity measurements at the site verified the hard massive nature of the bedrock and there were no indications of deeply weathered or faulted zones (FSAR 2.5).

Seismic Design

The maximum acceleration at the bedrock surface of the plant site from an earthquake is expected to be from 0.03g to 0.04g. Although this acceleration is considered to be conservative, the seismic design for structures and equipment important to safety are based on dynamic analyses using acceleration response spectrum curves together with a ground motion of 0.07g. The station is also designed so that the plant can be shutdown in a safe and orderly manner even if the ground acceleration were 0.14g (FSAR 2.5 and 12.2).

SUMMARY DESCRIPTION OF THE FACILITY

3.1 Introduction

The nuclear steam supply system of the Vermont Yankee Nuclear Power Station utilizes a General Electric boiling water reactor identical in most design features to Monticello Unit No. 1, the operation of which was recently authorized by the Atomic Energy Commission. The design of the features of the Vermont Yankee facility is based upon power technology attained during the development, design, construction and operation of boiling water reactors of similar types, including the Monticello facility. These features include the basic fuel design, Zircaloy fuel cladding, hydraulically operated control rods, in-core neutron monitoring instrumentation, pressure suppression containment and radioactive waste control.

The following discussion summarizes the principal design features of the Vermont Yankee facility which are significant to safety considerations. The FSAR and subsequent amendments present an extensive technical description and evaluation of this facility and FSAR references elaborating on the discussion below are given in each summary. Appendix C of this testimony gives a comparison of the significant station design features of Vermont Yankee to other boiling water power reactor stations. A drawing of a reactor and containment typical of the Vermont Yankee plant is shown in Appendix D.

3.2 *Reactor Primary System*

The reactor is a single cycle, forced circulation, boiling water reactor producing steam for direct use in the steam turbine.

The fuel for the reactor core consists of slightly enriched uranium dioxide pellets contained in sealed Zircaloy-2

tubes. These fuel rods are assembled into individual fuel assemblies of 49 fuel rods each. Each complete core loading consists of 368 fuel assemblies (FSAR 3.2).

Control of the reactor is achieved by movable control rods. Reactor power level control is augmented by controlling the recirculation flow rate through the reactor core. The core is designed so that the reactor can be shutdown from any point in its operating cycle by control rods alone. Stored energy will be available from reactor pressure and gas-charged accumulators to insert all control rods simultaneously for rapid shutdown of the reactor (FSAR 3.4).

In addition, there is provided a standby liquid control system containing a boron neutron-absorbing solution which is capable of shutting down the reactor and maintaining it in a shutdown condition. This system is an independent system that would be used to shutdown the reactor in the unlikely event that shutdown cannot be accomplished with the control rod system alone (FSAR 3.8).

The reactor pressure vessel contains the reactor core and supporting structure, the steam separators and dryers, the jet pumps, the control rod guide tubes, the feedwater and core spray spargers and other components. The main connections to the reactor vessel include the steam lines, reactor coolant recirculation lines, feedwater lines, control rod drive housings and other connections for core cooling. Appendix E is a cut-away view typical of the reactor vessel and core arrangement (FSAR 3.3).

Reactor Coolant will enter the reactor near the bottom of the core and flow upward through the fuel assemblies. The heat from the nuclear reaction will produce a mixture of steam and water. The steam will be separated from the water by means of steam separators and dryers located in the upper portion of the reactor vessel, and will then pass

through steam lines to the turbine. The separated water will mix with the incoming feedwater within the reactor vessel and the total flow will be returned to the core inlet through jet pumps located in the vessel. The motive force for the jet pumps will be supplied by the water discharged from two reactor coolant recirculation pumps. Variable frequency motor-generator sets supply power to the recirculation pump motors.

The design, fabrication, erection, testing, and certification of the reactor pressure vessel are discussed in detail in Amendment No. 13 to the license application (application dated December 2, 1966, Docket No. 50-271).

The plant has removable insulation in specified areas which permit direct inservice inspection of the exterior of the reactor vessel and other primary system components. This permits inspection of selected nozzle-to-shell welds, inspection of reactor vessel studs, nuts and bushings, selected sampling of high cyclic stress vessel welds, and selected sampling of coolant system piping, pumps, valve supports, and hangers. Inspection of the interior of the reactor vessel can be accomplished under water using remotely operable lights and visual aids such as borescopes and underwater TV cameras. (FSAR 4.2.6, 4.3.6, 4.4.8, and Section 4.6 of the Vermont Yankee Technical Specifications.)

3.3 *Plant Containment System*

The primary containment system, consisting of a steel light-bulb-shaped drywell, a steel doughnut-shaped pressure suppression chamber, and interconnecting vent pipes, provides the first containment barrier surrounding the reactor vessel and reactor primary system. Any leakage from the primary containment system is to the secondary contain-

ment system which consists of the reactor building, the plant standby gas treatment system, and the plant main stack. The integrated plant containment system and its associated engineered safeguards features is designed so that off-site doses resulting from postulated design basis accidents are well below the reference values stated in 10 CFR 100.

3.3.1 *Primary Containment System*

The primary containment is designed to accomodate the pressures and temperatures which would result from, or occur subsequent, to, a failure equivalent to a double-ended, circumferential rupture of a reactor coolant recirculation system line within the primary containment resulting in the loss of reactor water at the maximum rate. The pressure suppression chamber is a steel, torus-shaped pressure vessel approximately half filled with water, and . . . .

[USAEC STAFF SAFETY EVALUATION,
VERMONT YANKEE NUCLEAR POWER STATION,
Ex. 9, p. 5, AEC Dkt. No. 50-271]

. . . . connected by vent pipes to the doughnut-shaped steel water-filled suppression chamber (torus). The reactor vessel and the recirculation water piping, valves and pumps are housed in the drywell. The reactor is a direct-cycle, forced circulation, boiling water system which produces steam at 1000 psig. The reactor core uses slightly enriched uranium dioxide fuel in the form of pellets contained in Zircaloy tubes. Water, which serves as both the moderator and coolant, is pumped upward through the core where it boils due to the heat produced in the core. Two recirculation loops, each with a pump, provide the driving flow. The resulting steam is supplied to the turbine, which is directly coupled to the generator. After passing through the turbine, the steam is condensed, partially reheated and returned to the reactor.

SITE AND ENVIRONMENT

Site Description

The plant is located near the village of Vernon, Vermont, slightly less than four miles north of the Massachusetts state line. It is on the west bank of the Vernon Pond. The pond is formed behind the Vernon Hydroelectric Station dam one-half mile downstream on the Connecticut River. The west bank of the river forms the boundary between the states of Vermont and New Hampshire flows in a southeasterly direction in a narrow, steep-sided valley through the Pisgah Mountains. The terrain rises steeply from the valley floor in the vicinity of the plant and reaches the same elevation as the plant stack at a point 6300 feet from the plant. The site is bounded on the west by the village and on the . . . .

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF	
VERMONT YANKEE NUCLEAR POWER CORPORATION (VERMONT YANKEE NUCLEAR POWER STATION)	DOCKET No. 50-271

ORDER DETERMINING OBJECTIONS TO INTERROGATORIES

On April 30, 1971, Intervenor Natural Resources Defense Council (NRDC) submitted various interrogatories to Vermont Yankee Nuclear Power Corporation, the Applicant herein. Objections to these interrogatories were filed by the Applicant which emphasized the difference between interrogatories and motions for production of documents, as defined in the Federal Rules of Civil Procedure and as adapted by the Atomic Energy Commission to its Rules for proceedings. Applicant, after stating its general objection based upon this difference, then waived a portion of its objection by agreeing to make requested documentary material available for inspection and copying by the Intervenors.

The Atomic Safety and Licensing Board adheres to its ruling respecting the general objection made by Applicant to interrogatories submitted by New England Coalition on Nuclear Pollution in its Order dated May 11, 1971, and reasons therefor will not be repeated but are incorporated as fully as though set forth herein.

Applicant, in addition to a general objection which is sustained to the extent of the Order respecting New England Coalition on Nuclear Pollution interrogatories, also made specific objections to two main categories of interrogatories by NRDC which, however, were limited to one subject respecting the transportation and disposal of high level nuclear waste materials which will occur after leaving the plant site. The objection was upon the ground that off-site activities respecting such waste materials were not within the issues prescribed by the Commission for this proceeding.

Upon a consideration of the interrogatories and objections thereto,

IT IS ORDERED, in accordance with the Atomic Energy Act, as amended, and the Rules of Practice of the Commission, that the specific objection made by the Applicant respecting the transportation and disposal of high level waste products is sustained upon the ground that such considerations are not within the issues prescribed by the Commission for this proceeding, but rather are the subjects for other licensing activities.

ATOMIC SAFETY AND LICENSING BOARD

By SAMUEL W. JENSCH, *Chairman*

Issued:
May 11, 1971
Germantown, Maryland

AEC Docket No. 50-271

Applicant's Answers to

Interrogatories of

Natural Resources Defense Council

Served on

Vermont Yankee Nuclear Power Corporation

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

IN THE MATTER OF	
VERMONT YANKEE NUCLEAR POWER CORPORATION	Docket No. 50-271
(Vermont Yankee Nuclear Power Station)	

AFFIDAVIT OF DONALD E. VANDENBURGH

Now comes Donald E. Vandenburgh, and being on oath, deposes and says as follows:

1. That he is a Vice President of Vermont Yankee Nuclear Power Corporation.
2. That attached hereto, are the answers to the interrogatories propounded in the above entitled matter to Vermont Yankee Nuclear Power Corporation by Natural Resources Defense Council; and that there is also attached certain "Supplementary Information — IV Transportation: High Level Wastes from the Plant" which should be considered as supplementing the answers given with respect to Interrogatories Nos. IV.1-6, IV.(DIS).2, 4-6.
3. That in the preparation of these answers, he has consulted with the following individuals with regard to the questions set forth next to their names below:

Name	*Numbers*
R. M. Grube	I.1-7, V.1-18
R. J. Merlino	II.1-3, IV.1-22 IV(DIS) 1-8
W. P. Johnson	III.1-9
J. W. Stacey	IV(DIS) 9 and 10

4. That the answers attached hereto, are true and correct to the best of his knowledge and belief.

5. That on the advice of council and in view of the rulings of the Board with respect to certain objections sustained to the interrogatories, no answers are included for questions I.7 and IV.(DIS) 8.

DONALD E. VANDENBURGH
DONALD E. VANDENBURGH

COMMONWEALTH OF MASSACHUSETTS

WORCESTER, S.S. June 1, 1971

Then appeared before me, the above subscribed Donald E. Vandenburgh and made oath that he is a Vice President of Vermont Yankee Nuclear Power Corporation; that he is authorized to subscribe to the answers of that corporation to the interrogatories of the Natural Resources Defense Council; that he has read the foregoing affidavit; and that the statements set forth therein are true to the best of his knowledge and belief.

Before me,

ARMAND R. SOUCY
ARMAND R. SOUCY — Notary Public
My Commission Expires September 9, 1977.

I. BASIC INFORMATION

QUESTION I.1

How long is it expected that the Vermont Yankee plant will run before being shut down for fuel reloading and removal of high level wastes from the reactor core?

ANSWER I.1

The first cycle of plant operation is expected to run for about 18 months before shutdown for refueling. At the first shut down, about 4% of the fuel assemblies will be removed and stored for reinsertion in a later cycle. At the end of the second cycle of about 12 months, about 40% of the fuel assemblies will be removed for shipment and reprocessing.

QUESTION I.2

How often is it expected that refueling and removal of high level wastes will be necessary?

ANSWER I.2

For cycles subsequent to the second cycle, it is expected that shutdowns for refueling and removal of spent fuel assemblies will occur about every 12 months when about 25-30% of the assemblies will be removed.

QUESTION I.3

Where will the high level wastes removed from the reactor core be stored prior to their removal from the plant site?

ANSWER I.3

After removal from the reactor core, irradiated fuel assemblies will be stored in the spent fuel storage pool under 23 feet of water shielding. Spent fuel storage is described in Section 10.3 of the VY FSAR.

QUESTION I.4

How long will the wastes be stored at the site before they are removed?

ANSWER I.4

Spent fuel assemblies are normally stored for a minimum of 3 to 4 months prior to shipment to a reprocessing plant. It is not expected they would be stored longer than a year prior to shipment.

QUESTION I.5

By what means of transportation will the wastes be taken away from the plant? If this is expected to change during the lifetime of the plant, describe each means and the period over which it is expected to be used.

ANSWERS I.5

The means of spent fuel transportation has not been selected. VY facilities can accommodate both truck and rail transportation. Any means of transportation will be in compliance with government regulations. During the lifetime of the plant, more than one means of transportation could be used.

QUESTION I.6

If the wastes are to be reprocessed, at what plant or plants will this be done? If this is to change over the life of the plant, specify the periods during which each reprocessing plant or plants is/are to be used.

ANSWER I.6

It is planned that all VY spent fuel will be reprocessed. A plant for reprocessing VY's spent fuel assemblies has not been selected. The following reprocessing plants are now in operation, under construction, or planned for the

time period when the first batch of VY spent fuel will need to be reprocessed.

1. The Nuclear Fuel Services, Inc. plant in operation, at West Valley, New York.
2. The General Electric Co. plant under construction, at Morris, Illinois.
3. The Allied-Gulf Nuclear Services plant, under construction, at Barnwell, S.C.
4. The NUMEC Atlantic-Richfield plant, planned to be located at Leeds, S.C.

Over the life of the VY plant, several different reprocessing plants could be used.

QUESTION I.7

If the wastes are to be reprocessed at a reprocessing plant:

a.) Describe where the resulting reprocessed waste materials will be taken from the reprocessing plant. Include description of where reprocessed materials to be disposed of are to be taken, and where any other materials are to be taken. If this is expected to change during the life of the plant, give this description for each relevant period.

b.) By what means of transportation will each segment of the reprocessing wastes be taken to each of these destinations? If this is to change over the period of the plant's life, specify the means during each phase of the plant's life.

c.) Where will the waste products which must be disposed of be taken? If this is to change during the life of the plant, describe where the wastes are to be taken during each phase of the plant's life.

ANSWER I.7

We are advised by legal council that in view of the Board's findings, no answer is required.

QUESTION II.1

Describe in detail the procedures to be used to remove the radioactive materials from the reactor in order to allow for refueling, including, but not limited to:

a.) How is the reactor core vessel to be opened and processed to assure that no radioactivity escapes from the containment vessel during this process?

b.) What is the chemical and radiological composition of the materials which will be removed from the core at that time?

c.) What toxic chemical compounds will be present in this process, in what quantities and proportions?

d.) What radioisotopes will be present in the material removed from the reactor core at this time? List them, including the quantity expected of each, the proportion of the isotope to the total radioactive isotopes present, the total amount of radioactivity represented by each type of isotope (expressed in appropriate units), and the half-lives of each isotope.

ANSWER II.1

a.) The reactor is first shut down and cooled down. The top of the primary containment vessel is removed to expose the top of the reactor vessel. The bolted head of the reactor vessel is removed and the area flooded with about thirty feet of water. All subsequent operations are carried out under water. Core internals are removed and stored under water. The spent fuel is then removed and placed in special underwater storage racks within the reactor building. New fuel is then

installed into the core and the previous steps are reversed to place the reactor in operation again.

Under normal conditions and operations, no radioactivity will escape. The entire refueling area is surrounded by the reactor building which is automatically isolated should an incident occur which results in the release of any radioactive material. Section 14.6.4 of the FSAR, discusses the postulated radioactive release in the event of a refueling accident.

b.) Entire sealed fuel assemblies are removed during refueling. The chemical composition of the fuel is basically unchanged, that is an oxide, which now contains fission products which are listed in d.) below.

c.) No processing takes place at Vermont Yankee and no toxic chemical compounds are present.

d.) Attached are two lists which present the significant radioisotopes one day after shutdown, which is the earliest that fuel can possibly be moved. One list is of fission products and the second is an estimate of other significant radio-nuclides present in a single spent fuel assembly. The normal refueling procedure removes only about ¼ of a core during each shutdown (about 92 assemblies).

VERMONT YANKEE

FISSION PRODUCT INVENTORY

1 Spent Fuel Assembly

1 Day Decay

NUMBER	ISOTOPE	HALF-LIFE (SEC.)	CURIES AFTER 1 DAY DECAY	RATIO TO TOTAL
1	BR83	0.829E 04	0.158E 02	0.361E–05
2	BR84	0.198E 04	0.278E–08	0.635E–15
3	BR85	0.180E 03	0.000E 00	0.000E 00
4	BR87	0.563E 02	0.000E 00	0.000E 00
5	I129	0.505E 15	0.433E–02	0.990E–09
6	I31A	0.695E 06	0.896E 05	0.204E–01
7	I31B	0.695E 06	0.126E 05	0.290E–02
8	I132	0.828E 04	0.135E 06	0.309E–01
9	I133	0.755E 05	0.115E 06	0.264E–01
10	I134	0.315E 04	0.895E–02	0.204E–08
11	I135	0.241E 05	0.197E 05	0.451E–02
12	I136	0.840E 02	0.000E 00	0.000E 00
13	KR3M	0.686E 04	0.685E 02	0.156E–04
14	KR5M	0.158E 05	0.114E 04	0.260E–03
15	KR85	0.334E 09	0.167E 04	0.383E–03
16	KR87	0.468E 04	0.270E 00	0.617E–07
17	KR88	0.100E 05	0.356E 03	0.813E–04
18	KR89	0.192E 03	0.000E 00	0.000E 00
19	XE1M	0.103E 07	0.644E 03	0.147E–03
20	XE3M	0.198E 06	0.559E 04	0.127E–02
21	XE33	0.459E 06	0.244E 06	0.559E–01
22	XE5M	0.935E 03	0.598E 04	0.136E–02
23	XE35	0.326E 05	0.293E 04	0.671E–03
24	XE37	0.234E 03	0.000E 00	0.000E 00
25	XE38	0.101E 04	0.689E–20	0.157E–26
26	SE81	0.108E 04	0.134E–19	0.307E–26
27	SE3M	0.672E 02	0.000E 00	0.000E 00
28	SE83	0.150E 04	0.387E–13	0.886E–20
29	SE84	0.119E 03	0.000E 00	0.000E 00
30	RB88	0.108E 04	0.401E 03	0.916E–04
31	RB89	0.900E 03	0.290E–23	0.663E–30
32	RB90	0.161E 03	0.000E 00	0.000E 00

NUMBER	ISOTOPE	HALF-LIFE (SEC.)	CURIES AFTER 1 DAY DECAY	RATIO TO TOTAL
33	RB91	0.840E 03	0.231E–25	0.528E–32
34	RB92	0.800E 02	0.000E 00	0.000E 00
35	SR89	0.441E 07	0.179E 06	0.409E–01
36	SR90	0.884E 09	0.145E 05	0.332E–02
37	SR91	0.350E 05	0.405E 05	0.926E–02
38	SR92	0.972E 04	0.430E 03	0.982E–04
39	SR93	0.420E 03	0.000E 00	0.000E 00
40	SR94	0.119E 03	0.000E 00	0.000E 00
41	Y90	0.230E 06	0.145E 05	0.332E–02
42	Y91M	0.300E 04	0.256E 05	0.586E–02
43	Y91	0.529E 07	0.223E 06	0.511E–01
44	Y92	0.129E 05	0.743E 04	0.169E–02
45	Y93	0.359E 05	0.444E 05	0.101E–01
46	Y94	0.990E 03	0.125E–20	0.287E–27
47	Y95	0.630E 03	0.000E 00	0.000E 00
48	ZR95	0.563E 07	0.234E 06	0.535E–01
49	ZR97	0.613E 05	0.848E 05	0.193E–01
50	NB5M	0.323E 06	0.457E 04	0.104E–02
51	NB95	0.302E 07	0.244E 06	0.558E–01
52	NB7M	0.597E 02	0.834E 05	0.190E–01
53	NB97	0.444E 04	0.929E 05	0.212E–01
54	MO99	0.244E 06	0.184E 06	0.421E–01
55	MO01	0.900E 03	0.244E–23	0.558E–30
56	MO02	0.693E 03	0.477E–32	0.000E 00
57	MO05	0.119E 03	0.000E 00	0.000E 00
58	TC9M	0.215E 05	0.175E 06	0.401E–01
59	TC01	0.857E 03	0.502E–22	0.114E–28
60	TC2A	0.498E 01	0.480E–32	0.000E 00
61	TC2B	0.269E 03	0.781E–32	0.178E–38
62	TC05	0.597E 03	0.000E 00	0.000E 00
63	RU03	0.344E 07	0.112E 06	0.257E–01
64	RU05	0.161E 05	0.883E 03	0.201E–03
65	RU06	0.315E 08	0.128E 05	0.292E–02
66	RU07	0.287E 03	0.000E 00	0.000E 00
67	RH3M	0.341E 04	0.112E 06	0.257E–01
68	RH5M	0.450E 02	0.853E 03	0.194E–03
69	RH05	0.126E 06	0.227E 05	0.521E–02
70	RH06	0.300E 02	0.129E 05	0.295E–02
71	RH07	0.131E 04	0.169E–15	0.388E–22

NUMBER	ISOTOPE	HALF-LIFE (SEC.)	CURIES AFTER 1 DAY DECAY	RATIO TO TOTAL
72	SN27	0.741E 04	0.130E 01	0.297E–06
73	SN28	0.341E 04	0.340E–03	0.779E–10
74	SN30	0.156E 03	0.000E 00	0.000E 00
75	SB27	0.319E 06	0.443E 04	0.101E–02
76	SB28	0.597E 03	0.111E–04	0.255E–11
77	SB29	0.151E 05	0.729E 03	0.166E–03
78	SB30	0.597E 03	0.156E–02	0.357E–09
79	SB31	0.138E 04	0.164E–13	0.376E–20
80	SB32	0.126E 03	0.000E 00	0.000E 00
81	SB33	0.245E 03	0.000E 00	0.000E 00
82	TE7M	0.907E 07	0.133E 04	0.304E–03
83	TE7A	0.338E 05	0.380E 04	0.870E–03
84	TE7B	0.341E 05	0.797E 03	0.182E–03
85	TE9M	0.285E 07	0.131E 05	0.300E–02
86	TE9A	0.372E 04	0.532E 03	0.121E–03
87	TE9B	0.372E 04	0.130E 05	0.299E–02
88	TE1M	0.103E 06	0.954E 04	0.218E–02
89	TE1A	0.150E 04	0.469E–11	0.107E–17
90	TE1B	0.150E 04	0.217E 04	0.496E–03
91	TE32	0.280E 06	0.131E 06	0.300E–01
92	TE3M	0.378E 04	0.254E–01	0.580E–08
93	TE33	0.120E 03	0.128E–01	0.293E–08
94	TE34	0.263E 04	0.359E–04	0.821E–11
95	CS37	0.946E 09	0.144E 05	0.331E–02
96	CS38	0.192E 04	0.118E–07	0.270E–14
97	CS39	0.568E 03	0.000E 00	0.000E 00
98	CS40	0.660E 02	0.000E 00	0.000E 00
99	CS42	0.597E 02	0.000E 00	0.000E 00
100	BA7M	0.156E 03	0.135E 05	0.309E–02
101	BA39	0.509E 04	0.217E 01	0.498E–06
102	BA40	0.110E 07	0.227E 06	0.520E–01
103	BA41	0.107E 04	0.189E–18	0.432E–25
104	BA42	0.660E 03	0.000E 00	0.000E 00
105	LA40	0.144E 06	0.239E 06	0.547E–01
106	LA41	0.136E 05	0.316E 04	0.722E–03
107	LA42	0.509E 04	0.199E 01	0.456E–06
108	LA43	0.114E 04	0.352E–17	0.804E–24
109	CE41	0.276E 07	0.228E 06	0.523E–01
110	CE43	0.118E 06	0.137E 06	0.314E–01

NUMBER	ISOTOPE	HALF-LIFE (SEC.)	CURIES AFTER 1 DAY DECAY	RATIO TO TOTAL
111	CE44	0.246E 08	0.187E 06	0.427E–01
112	CE45	0.180E 03	0.000E 00	0.000E 00
113	CE46	0.840E 03	0.121E–25	0.277E–32
114	PR43	0.120E 07	0.222E 06	0.507E–01
115	PR44	0.105E 04	0.187E 06	0.428E–01
116	PR45	0.215E 05	0.937E 04	0.214E–02
117	PR46	0.144E 04	0.241E–12	0.551E–19
118	ND47	0.100E 07	0.787E 05	0.179E–01
119	ND49	0.719E 04	0.966E 01	0.220E–05
120	ND51	0.900E 03	0.205E–24	0.469E–31
121	PM47	0.794E 08	0.342E 05	0.782E–02
122	PM49	0.194E 06	0.302E 05	0.691E–02
123	PM51	0.100E 06	0.913E 04	0.208E–02
124	SM51	0.230E 10	0.110E 02	0.252E–05
125	SM53	0.169E 06	0.423E 04	0.966E–03

TOTAL = 0.4375E 07

VERMONT YANKEE

Other Significant Radionuclides In

1 Spent Fuel Assembly

ISOTOPE	HALF LIFE (Yrs)	MASS (Kg)
U-235	7.1×10^{8}	1.60
U-238	4.51×10^{9}	185.0
Pu-239	2.44×10^{4}	0.84
Pu-240	6.60×10^{3}	0.45
Pu-241	1.43×10^{1}	0.15

The total activity of these radionuclides is about 2×10^{4} curies.

QUESTION II.2

What impact would the chemical compounds described above, in the quantities which will be present at the time of refueling, have on the environment, including human beings, if they were to escape the containment vessel?

ANSWER II.2

As no chemical compounds are employed, no environmental effects are involved.

QUESTION II.3

What impact would the radioisotopes present in the materials removed from the reactor core vessel have on the environment, including human beings, if they were to escape the containment vessel? a.) Include short and long term effects, specifying the length of time each isotope would be dangerous to life. b.) Describe how these materials might be disseminated through the environment — for example, could they be disseminated through underground aquifers at the plant site, or by the Connecticut River, or by other means?

ANSWER II.3

Any release of these radioisotopes is considered unlikely since they are contained in sealed fuel tubes and no processing of the fuel is to be performed at the site. The only postulated incident involves the dropping of a fuel assembly while it is being moved from the reactor vessel to the storage pool. This operation is performed under water and within the confines of the reactor building. In the event the fuel assembly were dropped and significantly damaged, some of the fission product gases contained in the gap between the fuel pellets and the cladding might escape and rise to the surface of the storage pool. The analysis of this incident is presented in Section 14.6 of the FSAR.

QUESTION II.4

What facilities have been built into the plant to prevent an accident which would disseminate the chemical and/or radiological materials into the environment.

ANSWER II.4

As stated in the answer to question II.2, there are no chemical compounds employed in the nuclear coolant system, therefore, none can be released in the event of an accident.

Section 4 of the station Final Safety Analysis Report (FSAR) describes the reactor coolant system in detail. The reactor vessel and connecting piping systems which makeup the reactor coolant system provide a barrier against leakage of radiological materials into the primary containment. The reactor vessel is designed, fabricated, inspected and tested in accordance with the ASME Boiler and Pressure Vessel Code, Section III. Reactor coolant piping is designed and constructed in accordance with the USA Standard Code for Pressure Piping, Power Piping, USAS B 31.1.0, 1967. These codes require large safety margins between the design pressure for vessels and piping and the actual pressure where the material would fail.

Other requirements providing assurance of the reactor coolant system barrier integrity are the quality assurance and quality control programs employed during construction. In addition, an inservice inspection program will affirm continuing integrity of the coolant barrier throughout the life of the plans.

Section 7.2 of the FSAR describes the reactor protection system. This system is designed to provide protection against the onset of conditions that threaten the integrities of the fuel cladding and the reactor coolant system barrier.

The system continuously senses the pertinent reactor parameters and will automatically perform its safety function independent of operator action.

Reactor safety is further assured by operators who are skilled, highly trained men who must demonstrate their proficiency to the AEC Division of Reactor Licensing to qualify for their positions. The operator is trained to recognize conditions that could conceivably lead to a situation which would require action by the reactor protection system and to take action to safely shutdown the reactor.

In short, many considerations are taken into account in the design, fabrication, construction, testing and operation of a reactor plant to provide a high degree of certainty that an accident will not occur.

QUESTION II.5

Assuming that the chemical and/or radiological materials, or some part thereof, did escape the containment vessel, what plans exist for preventing further dissemination of them into the environment?

ANSWER II.5

This response is directed to the radiological aspects of the question since no chemical compounds are present in the reactor coolant system.

There are numerous station facilities built for the purpose of preventing dissemination of radiological materials into the environs in the event of an accident. Detailed descriptions of these facilities and how they function during accident conditions are a substantial part of the written work presented in the four volumes of the plant FSAR.

Section 5 of the FSAR describes the primary and secondary containments and the functions of each to mitigate

the effects of an accident. Section 14.6 of the FSAR presents analyses of various design basis accidents including responses of the primary and secondary containments to the design basis accidents where applicable.

Section 6 of the FSAR describes the systems (core standby cooling systems) which will automatically provide sufficient cooling to the reactor core in the event of a loss of coolant accident. Analyses for the various loss of coolant accidents are also presented in Section 6.

Section 7 of the FSAR describes the instrumentation and controls used for reactor protection circuitry, primary and secondary containment isolation circuitry, reactor core isolation cooling systems circuitry as well as other reactor control systems.

QUESTION II.6

Under what circumstances is it credible that the chemical and/or radiological materials described in the above schedule of questions, or any part thereof, could escape from the containment vessel? Supply any relevant studies upon which this judgment is based.

ANSWER II.6

As mentioned previously in answers II.2, II.4, and II.5, no chemical compounds are employed, therefore, the portion of the question pertaining to chemicals is not applicable.

Section 14.6 of the FSAR presents detailed analyses of the credible design basis accidents and the analytical results in terms of off site doses to the public. A credible design basis accident is a hypothesized accident the characteristics and consequences of which are utilized in the design of those systems and components pertinent to the preservation of radioactive material barriers and the re-

striction of radioactive material release from the barriers. The hypothesized accident is a "worst case" situation which, even though it is extremely unlikely ever to happen, is assumed to occur coincident with other highly unlikely events such as loss of off site electrical power and an earthquake. The doses are calculated based upon radiological materials escaping into the environs. The quantity of escaping radioactive materials are analytically determined based on a series of very conservative assumptions (conservative in that actual dose rates would likely be much less than those shown in the analysis).

Section 8 of the FSAR describes emergency electrical power circuits, components and sources (AC and DC).

III. FUEL HANDLING

QUESTION III.1

Describe the procedures by which fuel materials received at the plant gate will be processed and stored, specifying the accounting and security procedures which will be used to prevent accidental loss or theft of these materials during receiving, storage prior to loading, or while the fuel is being loaded into the reactor.

ANSWER III.1

The following procedure provides the answer to this question.

1.0 SCOPE

This procedure establishes requirements for the control of special nuclear material in the facility of Vermont Yankee Nuclear Power Corporation where such material is used directly or indirectly in the production of electrical energy. The materials involved in this facility are uranium and plutonium of various isotopic content. The nuclear

material control system involves the establishing of receipts from the shipper, six internal material balance areas, and records of shipments to a reprocessor or other licensed receiver as the means of maintaining control and accountability of all leased, or owned special nuclear material, or special nuclear material owned by others but residing in the facility of Vermont Yankee.

2.0 DEFINITIONS

2.1 Special Nuclear Material (SNM)

A. 10 CFR 70

Special Nuclear Material as defined by 10 CFR 70 is as follows: "(1) Plutonium, Uranium -233, uranium enriched in the isotope 233, or in the isotope 235, and any other material which the Commission, pursuant to the provisions of Section 51 of the act, determines to be Special Nuclear Material, but does not include source material, or; (2) any material artificially enriched by any of the foregoing but does not include source material."

B. Nuclear Material Control and Safeguards System For the purposes of these proceedings the following shall be considered to be units of special nuclear material:

1. Fuel Assemblies or separate fuel pins
2. Source Range Monitors (SRM's)
3. Intermediate Range Monitors (IRM's)
4. Local Power Range Monitors (LPRM's)
5. Traversing In-Core Probe Monitors (TIP's)
6. Subcritical Training Assembly

2.2 Material Balance Areas

For the purpose of maintaining control over the special nuclear material at the reactor site, the plant shall be divided into the following special nuclear material balance areas:

A. New Fuel Storage Vault

B. Spent Fuel Storage Pool

C. Reactor

D. Reactor Operating Floor

E. Warehouse

F. Training Laboratory

2.3 Authority and Responsibility

All special nuclear material on site shall be under control of the Reactor Engineer by direction of the Plant Superintendent. All reporting to the Central Accountability Office shall be done through the Reactor Engineer.

3.0 RECEIPT OF SPECIAL NUCLEAR MATERIAL

3.1 Each receipt of special nuclear material shall be accompanied by a bill of lading or packing list which contains a listing of the shipping containers involved in the shipment as well as a loading schedule for each shipping container. The loading schedule should show:

(a) The serial number of the shipping container

(b) The serial number of the individual units of special nuclear material contained in the shipping container.

(c) The type of special nuclear material.

3.2 A piece count of shipping containers shall be performed upon receipt and the serial numbers of the shipping containers received shall be compared with those shown on the shipping documents. Upon removal of the units of special nuclear material from the shipping containers, the serial numbers of the individual units of special nuclear material received shall be compared with those shown in the shipping documents.

3.3 After the unloading of each shipment the Central Accountability Office shall be notified of the date of receipt of the special nuclear material and the serial numbers of the units of special nuclear material using a pre-printed form, VY0002.

4.0 STORAGE OF SPECIAL NUCLEAR MATERIAL

4.1 The storage of all receipts of special nuclear material shall be in a Material Balance Area. Operations pertaining thereto shall be restricted to selected employees named by the Reactor Engineer and approved by the Plant Superintendent. There is no personal access to the new fuel vault.

4.2 A record shall be maintained of the contents of all storage locations showing the serial numbers of all units of special nuclear material received or removed, the dates of such receipts or removals, and the location of each unit of special nuclear material in the storage location.

4.3 Immediately upon removal of units of special nuclear material from their storage locations the Central Accountability Office shall be notified of the date of such removal, the serial numbers of the units of special nuclear material removed, and the

disposition of the removed units, — using preprinted forms, VY0003, and VY0004, VY0005 or VY0006.

5.0 REACTOR OPERATION

5.1 A unit of special nuclear material is introduced into or removed from the Reactor only during refueling.

5.2 The Central Accountability Office shall be promptly notified of the location of each unit of special nuclear material in the Reactor upon its introduction thereto, using VY0003 and VY0007 or VY0008 and of any relocation of units of special nuclear material during refueling operations using VY0007 or VY0008.

5.3 A record shall be maintained in the Reactor Control Room showing the serial numbers of the units of special nuclear material charged to or removed from the Reactor, the dates of such charging or removal, and the location of each unit of special nuclear material in the Reactor. At the conclusion of refueling the Central Accountability Office shall be furnished with a copy of the Core Fuel Assembly lay-out plan, VY0007, and in-core instrumentation lay-out form VY0008.

5.4 Immediately upon removal of irradiated units of special nuclear material from the Reactor, the Central Accountability Office shall be notified of the date of such removal, the serial numbers of the units of special nuclear material removed, and the disposition of the removed units using preprinted forms VY0003 and VY0009.

5.5 A member of the Plant Reactor Engineers staff at the Vermont Yankee site shall be responsible for the calculation of Core depletion and plutonium production. He shall also determine the placement of assemblies in the reactor at the time of refueling.

5.6 At the end of Core life the Central Accountability Office shall be notified of the depletion of special nuclear material by units in both total uranium and Uranium 235, and the plutonium production the Core has experienced during its residence in the Reactor, identifying each unit by serial number. During Core life at the end of each reporting period, using form AO-1, the Central Accountability Office shall be notified of the uranium depletion and plutonium production experienced in the Core during the period to be reported.

6.0 STORAGE OF IRRADIATED SPECIAL NUCLEAR MATERIAL

6.1 The storage of all irradiated units of special nuclear material shall be effected in a Spent Fuel Pool, which will be located in a controlled Access Area. Access to the area shall be restricted to selected employees.

6.2 The Central Accountability Office shall be notified of the location of each irradiated unit of special nuclear material in the Spent Fuel Pool upon its receipt, and of any subsequent change in location using forms VY0003.

6.3 A record shall be maintained in the Spent Fuel Pool area showing the serial numbers of the units of special nuclear material received at and removed from the area, the dates of receipt and removal

from the Spent Fuel Pool, and the location of each unit of special nuclear material. The location of the units of special nuclear material in the Spent Fuel Pool shall be recorded on VY0009 and a copy of this form shall be sent to the Central Accountability Office.

6.4 Immediately upon removal of irradiated units of special nuclear material from the Spent Fuel Pool, the Central Accountability Office shall be notified of the date of such removal, the serial numbers of the units of special nuclear material removed, and the disposition of the removed units — using a preprinted form VY0010.

7.0 SHIPMENT OF SPECIAL NUCLEAR MATERIAL

7.1 Each shipment of special nuclear material shall be accompanied by a bill of lading or packing list which shows the serial number of the shipping cask involved and a loading schedule which shows the serial numbers of the individual units of special nuclear material contained in the cask.

7.2 After the loading of each shipment, the Central Accountability Office shall be notified of the date of shipment of special nuclear material, the serial numbers of the units of special nuclear material shipped, the serial number of the shipping cask and the consignee of the shipment using form VY0010.

8.0 INVENTORY OF SPECIAL NUCLEAR MATERIAL

8.1 At least semi-annually a complete inventory of all new, irradiated, or Reactor contained special nuclear material shall be taken.

8.2 A physical inventory of new and irradiated units of special nuclear material shall be taken and their individual serial numbers recorded. The identity of units of special nuclear material contained in the Reactor Core shall be taken from Control Room records.

8.3 The special nuclear material content (isotope and element) of new units of special nuclear material shall be assumed to be that represented to be contained in each unit by the fabricator and which may be subject to inspection verfication.

8.4 The Central Accountability Office shall be notified by the site staff of the depletion of special nuclear material stated in both total uranium and Uranium 235 and plutonium production. The values so reported shall constitute the special nuclear material inventory of the Reactor Core.

8.5 The special nuclear material content (isotope and element) of irradiated units of special nuclear material shall be assumed to be that as computed and submitted to the Central Accountability Office as described in Section 5.6.

8.6 The limit of error in determining (or estimating) the amount of special nuclear material contained in the units of special nuclear material comprising the inventory shall be established and the overall measurement uncertainty for the inventory shall be determined by propagation of error techniques.

9.0 RECORDS AND REPORTS

9.1 The Central Accountability Office shall maintain records of receipts, transfers and shipments of spe-

cial nuclear materials as defined in Section 2.1B items 1 and 6 in each material balance area. These records shall show serial numbers for each unit of special nuclear material and the weight of contained special nuclear material (element and isotope), the composite limit of error associated with the determination of the latter, and a reference for the determination of the limit of error involved (such as the fuel fabricator's shipping document and the Reactor Engineer's calculated burn-up). These records shall be organized such that a running inventory of special nuclear material can be determined readily from the records.

9.2 The Central Accountability Office shall maintain records of receipts, transfers, and shipments of special nuclear materials held off-site by other licensees for Vermont Yankee is financially responsible for these materials. The Central Accountability Office shall also maintain records of materials owned by others but residing in the facility of Vermont Yankee. These records shall show the same information as set forth in (1), above.

9.3 The fabricator of units of special nuclear material shall provide a special nuclear material transfer document to the Central Accountability Office for each shipment of special nuclear material to Vermont Yankee. This transfer document shall contain, or shall have attached thereto, and made a part thereof, supplementary data sheets showing:

(a) Unit of special nuclear material identification numbers.

(b) Weight of special nuclear material (element and isotope) contained in each fuel assembly.

(c) The measurement uncertainty connected with the determination of the special nuclear material content of the material contained.

Additionally, it is desireable that the fabricator provide for Vermont Yankee, and Vermont Yankee will try to obtain the following information from the fabricator for units of special nuclear material furnished as fuel assemblies:

1) Fuel rod identification numbers for each fuel assembly.

2) Weight and lot number of fuel material in each fuel rod.

3) Weight of special nuclear material (element and isotope) contained in each fuel rod.

4) A correlation between the UO_2 pellet lots and the fuel rod numbers wherein the pellets are contained, and the results of special nuclear material analysis of each UO_2 pellet lot (element and isotope).

9.4 The documentation described in Section 3.3 concerning receipts of units of special nuclear material shall be checked against the special nuclear material transfer document provided by the shipping licensee. Discrepancies shall be investigated and resolved promptly.

9.5 The transfer document and the stated special nuclear material content of the units of special nuclear material shall be certified by a responsible member of the shipping licensee's management staff. The shipping licensee's values of the special nuclear material content units of special nuclear material shall be entered in the Accountability Ledger for Vermont Yankee on an individual basis.

9.6 Two Control Accounts shall be maintained showing total amount of special nuclear materials held on lease or owned. One Control Account shall show total uranium, Uranium 235, and total dollar valuation of the material leased or owned. The second Control Account shall show total plutonium total Plutonium 239 plus Plutonium 241, and dollar valuation of the material leased or owned.

9.7 The Central Accountability Office shall prepare a special nuclear material transfer document for each shipment of special nuclear material. This transfer document shall have attached thereto, and made a part thereof, VY0010 supplementary data showing:

(a) Unit of special nuclear material identification numbers.

(b) Estimated weight of special nuclear material (element and isotope) contained in each unit of special nuclear material as obtained from burn-up calculations described in Section 5.6.

(c) An estimate of the measurement uncertainty involved in the burn-up calculations.

9.8 The values shown on the transfer document for the special nuclear material content of the units of special nuclear material shipped shall be entered in the Accountability Ledger for the Power Reactor Facility on an individual shipment basis.

9.9 Upon receipt of the reprocessor's report of measurements of the special nuclear material content of the irradiated units of special nuclear material during reprocessing, and approval thereof, the Accountability Ledger shall be adjusted to reflect the results of the reprocessor's measurements.

9.10 The Central Accountability Office shall prepare a material balance for special nuclear materials for each six month period showing beginning inventory, receipts, shipments, burnup, ending inventory and the uncertainty connected with each.

QUESTION III.2

How long does the process of loading and reloading take?

ANSWER III.2

Loading and reloading is defined as the time required to remove designated used fuel from the reactor, relocate partially used fuel to new core positions and install new fuel into the reactor. The stated times *do not include* time for preparation and completion of loading such as reactor vessel head removal and replacement.

The process for loading and reloading the fuel initially will require twelve days. On subsequent reloadings after the plant has been operational, the twelve days will be reduced to approximately seven days. This reduction in time required on the subsequent reloadings is due primarily to the fact that some work can be accomplished prior to the refueling. Channeling, for instance, which consists of installing a fuel assembly into a shroud-like enclosure, is performed on a partial number of fuel assemblies prior to the actual loading operation.

QUESTION III.3

How many workers are involved in this process?

ANSWER III.3

The total number of workers involved in this process are twenty-one. This is broken down into seven per shift. The operation will involve around the clock work consisting of three shifts.

QUESTION III.4

What precautions are taken in the selection of personnel to handle this task to assure that none will steal or lose fuel materials during receiving, storage, or loading of fuel materials?

ANSWER III.4

All applicants for plant staffing are screened and interviewed in a manner that would disclose if any person is mentally disturbed. All applicants meet and are interviewed by a minimum of three plant supervisory staff members, who explore applicants background history and present and future goals.

QUESTION III.5

What precautions will be taken to assure that no nuclear material will be removed from the plant grounds by workers at the plant?

ANSWER III.5

A Station Security Program has been established to provide physical security, protection against impairment of necessary plant functions, and theft of Company equipment. A Security Force is established and is responsible to achieve these goals. The detailed Industrial Security Plan is considered to be proprietary since divulging its contents to the public would seriously impair its effectiveness.

The physical size and weight of the fuel is a major factor in preventing its removal from the plant site. Each assembly is approximately 14.5 feet long, 5.4″ x 5.4″ square and weighs approximately 580[1] pounds. Once fuel has been irradiated in the reactor, it has to be handled under water

[1] This is a typographical error in the original and should read *"680"* instead of "580". See FSAR (*Ex.* 1) §1.7, Table 1-7-1.

or in a heavily shielded cask. Such a cask would weigh many tons, requiring the use of a large crane to handle it.

QUESTION III.6

What is the percentage of nuclear fuel material expected to be lost, stolen, or otherwise unaccounted for at the plant site over the expected life of the plant, based upon previous experience of the Atomic Energy Commission?

ANSWER III.6

The percentage of nuclear fuel material expected to be lost, stolen, or otherwise unaccounted for at the plant site over the expected life of the plant is zero. Since we are unable to speak for the Atomic Energy Commission, this statement is based upon eleven years of operation at the Yankee Rowe Plant and four years of operation at the Connecticut Yankee Plant.

QUESTION III.7

What would be the maximum impact upon the environment, including persons, should this amount of material find its way into the environment outside the plant grounds?

ANSWER III.7

Since zero loss of nuclear material is expected, there would be no impact upon the environment.

QUESTION III.8

How much of the material expected to become lost, stolen, or unaccounted for at the plant site during the life of the plant, is expected to find its way into the environment, based on the past experience of the Atomic Energy Commission?

ANSWER III.8

Since none of the material is expected to become lost, stolen, or unaccounted for at the plant site during the life

of the plant, none is expected to find its way into the environment.

QUESTION III.9

Supply any relevant studies upon which the judgments called for above are based.

ANSWER III.9

The above judgments are based on a total operating experience of fifteen years. This operating experience consists of eleven years at the Yankee Nuclear Power Plant in Rowe, Mass. and four years at the Connecticut Yankee Haddam Neck Plant. During five of the years at the Yankee Rowe Plant, per agreement with the U. S. Government, the Plant was under voluntary inspection performed by the International Atomic Energy Agency. The purpose of these inspections was to verify that no nuclear material had been lost, stolen, or diverted from the Plant. It should be noted that the Yankee Rowe Plant was the only nuclear plant whose management volunteered to submit to such periodic inspections. The results of these inspections again verified that no nuclear material was lost, stolen, or unaccounted for at the Plant site.

V. TRANSPORTATION — FUEL FOR THE PLANT

Comment: New fuel shipped to the plant is in the form of fuel assemblies. The uranium oxide and mixed uranium-plutonium oxide is in the form of high density, ceramic pellets contained in sealed Zircaloy tubes which together with other hardware are assembled into fuel assemblies.

1. *Q.* Describe the package in which fuel will be delivered to the Vermont Yankee plant. Include information as to its weight, size, and markings.

A. The packages used for delivering fuel must be specially-designed for the type of fuel assembly and specially approved by the Atomic Energy Commission (AEC) and the Department of Transportation (DOT) prior to their use. A description of the package being used for Vermont Yankee's first fuel together with weight and size information is contained in Exhibit V-A. The package is marked in compliance with DOT regulations for shipping purposes as follows:

a. Consignee's name and address
b. Shipper's name and address
c. DOT Special permit number
d. Type of package
e. Transport Group number
f. Fissile Class number
g. Radioactive Material label
h. CG mark (Center of Gravity)

The package(s) to be used for subsequent fuel assemblies is unknown; however, it will comply with AEC and DOT requirements. The radioactivity level at the surface of the package is approximately 1 mr/hr.

2. *Q.* What amount of radioactive fuel material will be contained in each package? Express this in terms of mass — e.g. in kilograms — and in terms of its chemical composition and radioactivity (in appropriate units).

A. The fuel assemblies in each package contain approximately 440 kilograms of uranium dioxide (387 kilograms of uranium) and will have no more than 0.5 curies of radioactive material.

3. *Q.* What percentage of the fuel to be used at the Vermont Yankee plant over its useful life will be plutonium: Give the information asked for in V.1 and 2 above with respect to this fuel material.

A. It is planned to include in the first fuel used, four assemblies that are partially fueled with plutonium for the purpose of obtaining technical data. These assemblies are nearly identical in design to all-uranium assemblies, the major difference being that some of the sealed rods contain uranium-plutonium mixed oxide pellets rather than all uranium oxide pellets. The plutonium in these assemblies will comprise about 0.009% of the combined uranium and plutonium in the initial fuel loading. At some time in the future it is probable, after having obtained the required regulatory approvals, that plutonium will be used to replace some of the uranium in new fuel assemblies. If it is assumed that all plutonium produced in Vermont Yankee is used in new fuel as early as possible and is continued to be used until fast breeder reactors require plutonium for fuel, the schedule for new fuel insertion and its uranium-plutonium composition might be as follows:

Year of Plant Operation When New Fuel is Inserted	Percentage Composition of New Fuel	
	Uranium	Plutonium
0	99.991	0.009
1– 4	100	0
5–19	99.3–99.0	0.7–1.0
20–30	100	0

Therefore, it is expected that no appreciable quantity of plutonium will be used in new fuel until after 4-5 years of plant operation and that it will then be used

for a period of about 15 years. The package to be used for shipping the four part-plutonium assemblies will be the same as that used for all-uranium assemblies as described for Question V.1. The package to be used for future part-plutonium assemblies is unknown. All packages and shipments will comply with AEC and DOT requirements. The mass of material will be about the same as in V.2, above. The chemical composition of material in the sealed Zircaloy rods will be a mixture of uranium dioxide and plutonium dioxide. If future part-plutonium assemblies are similar in design to the first four the amount of radioactivity per container is estimated to be about 18,000 curies. Measurements on rods making up the first part-plutonium assemblies indicate a gamma activity of only 2 mr at a distance of 2 feet from the rods and 12 mr at a distance of one inch.

4. *Q.* How many packages of uranium fuel will be delivered on each truck/train (whichever will be used for delivery — both if both apply)?

A. The first fuel is being shipped by truck. Each truckload consists of up to 16 containers, each containing two fuel assemblies. It is not known whether future new fuel shipments will be by truck or by rail. Facilities for receiving both types of shipments exists at the VY plant. It is not known how many containers will, in the future, be loaded onto each vehicle. However, all shipments made will be in compliance with AEC and DOT regulations which specify limits for the number of containers on a vehicle.

5. *Q.* Where will this fuel be shipped from?

A. All of the first fuel assemblies (710,840 kg uranium) and 2.4 reloads of fuel assemblies (55,440 kg

uranium) are shipped from Wilmington, N. C. Since the manufacturers of subsequent fuel reloads have not been selected it is not known from what locations such reloads will be shipped.

6. *Q.* By what route will the fuel travel in order to reach the Vermont Yankee plant? Give route numbers of roads which will be used, specifying any cities through which trucks will pass. If railroad is to be used, specify cities through which the trains will pass and indicate clearly where these train routes are.

A. The route of first fuel shipments begins by taking US-421 from Wilmington, N. C. to its junction with Interstate-95; thence north on Interstate-95 to its junction with US-301 in Richmond, Va. Take US-301 north, bypassing Washington, D. C. to east and cross Chesapeake Bay via the Annapolis-Queenstown Bridge to Wilmington, Delaware. Through Wilmington and across the Delaware River over the Delaware Memorial Bridge on Interstate-295. Travel 295 to its junction with US-130. North on US-130 through Camden, N. J. but bypassing Trenton, N. J. to the junction of US-130 and US-1 and 9. North on US-1 and 9 over the George Washington Bridge in New York City to its junction with Interstate-95. East on 95 through Bridgeport, Conn. to New Haven where connection is made with Interstate-91. Through New Haven north on Interstate-91 through the cities of Hartford, Conn., Springfield, Mass. and Brattleboro, Vt. At Brattleboro connect with State Route-142 south to the plant site at Vernon, Vt.

7. *Q.* What, if any, calculations have been made to determine the chances of an accident involving fuel-

carrying vehicles over the life of the plant? If such calculations have been made, what are the results?

A. The National Safety Council publishes as public information, yearly statistics of all highway accidents, including as part of the report, truck accidents involving hazardous materials. These reports indicate there are so few nuclear fuel truck accidents each year that any statistic obtained by this method would not be of worthwhile significance if we attempted to use it as a life-of-the-plant vehicular accident probability factor. Note, however that in the event that an accident did occur involving nuclear fuel, simulated accident tests which the fuel containers have successfully withstood demonstrate that the fuel would remain intact, moreover even if through some catastrophic event, the fuel material (UO_2 pellets) were dispersed, no significant environmental effect would occur.

8. *Q.* What, if any, tests have been conducted using the type of containers in which fuel elements are to be shipped, to determine the conditions under which they might burst open or otherwise release radioactive material?

(a) Have any of these tests been conducted under actual conditions — involving dropping the container from a moving truck or train, for example — as opposed to in a laboratory with standard bursting and puncture tests?

(b) If such tests have been conducted, describe the tests and the results.

A. The fuel package tests conducted are the water immersion, fire and 30-foot drop tests. Specifications and standards are established by the AEC as pre-

scribed in 10CFR, Part 71: 31, 32, 34, 35, 36 and Appendices A & B and for the DOT as prescribed in 49CFR, Part 173:393 & 398. Results for first fuel packages are documented in Exhibit V-A.

(a) No tests for first fuel packages have been conducted under actual conditions involving dropping the containers from a moving truck or train.

(b) See (a).

9. *Q.* Describe the methods used to secure the containers in which fuel elements will be shipped to the Vermont Yankee plant to the trucks or railroad cars on which they will be shipped.

A. The method used to secure first fuel containers to the truck is to pass ⅜" steel link chain up the sides of the containers, over the top of the container block and down the other side. Both ends of the chain are hooked loosely to the trailer stake pockets. A chain binder is then placed at one side of the chain to pick up the slack in the chain. The slack is picked up one link at a time until the chain is so tight that one man using a length of steel pipe can scarcely close the binder. Three chains are used on each container or container block, spaced equi-distantly from each other along the length of the containers.

10. *Q.* Approximately how long will be required to release the containers from these fasteners? How is this accomplished?

A. Releasing the containers is accomplished by opening the chain binders. Normally, this requires very little time — 15 minutes at most. Subsequent unloading of the containers, however, is not so easily accomplished because of their weight (2800 pounds each) and materials handling equipment is required.

11. *Q.* How many stops will be made between the time the truck(s) or train(s) leave the original shipping point and the time they reach the Vermont Yankee plant?

A. All first fuel shipments are by truck. Normally four to six stops are required by the truck from the time it leaves Wilmington, N. C. until arrival at the plant site at Vernon, Vt.

12. *Q.* What is the value, in dollars, on the present American market of the quantity of fuel to be shipped on each truck/train?

A. Each full truckload of 16 containers of the first fuel will carry fuel assemblies valued at $1,800,000. Of this, the value of the contained uranium is $1,000,000, the balance of $800,000 being for fabrication of the fuel assemblies. For the fuel assemblies as such, to have the full value of $1,800,000 to another party on the American market the other party would need to have a reactor nearly identical in design to VY in which to use them. For the contained uranium to have value to others, in itself, it would be necessary to reprocess the assemblies to recover the uranium in a usable form. In addition to destroying the fabrication value, reprocessing could only be done at considerable expense which would effectively reduce the value of the uranium to others. If the uranium recovery were done in a reprocessing plant the uranium value would be decreased from $1,000,000 to about $800,000.

13. *Q.* What is its value on the international market?

A. On the present international market the situation would be essentially the same as for the American mar-

ket (Question 12) except that the contained uranium might be slightly less in value.

14. *Q.* What studies have been made to determine the likelihood of hijacking or theft of fuel or fuel containers during transit to the Vermont Yankee plant? Supply studies and describe their conclusions.

A. Although there have been no specific studies made to determine the likelihood of hijacking or theft of fuel during transit to Vermont Yankee, the manufacturer of the first fuel assemblies has an established fuel monitoring system requiring each vehicle transporting fuel to report its position and other important information by telephone every six hours during the trip to a responsible monitoring unit. This frequent telephonic surveillance of each shipment would quickly alert the fuel manufacturer to any attempted hijack or theft of nuclear fuel. Fuel shipments are made by direct sleeper truck-trailer service with two drivers and no transfer of equipment or drivers straight through to destination. The size and weight of the fuel containers would very likely preclude any theft or hijacking except by use of heavy duty special purpose handling equipment.

15. *Q.* What is the present best estimate of the chances of a hijacking or theft of fuel during shipment to the Vermont Yankee plant over the estimated life of the plant, assuming presently planned precautions are taken?

A. The present best estimate is that the chance of a hijacking or theft occurring during shipment of Vermont Yankee fuel is remote because of the precautions taken during shipment, and lack of any illegal use for

the material. To the best of our knowledge, there has never been a theft or hijacking, or an attempt at theft or hijacking, during the shipment of nuclear fuel assemblies.

16. *Q.* What would be the likely environmental impact, including impact on persons, of the release of radioactivity from a shipping container which was stolen or lost in transit, and later opened?

A. There is absolutely no environmental impact or effect on living creatures upon contact with or proximity to intact nuclear fuel assemblies because of their insignificantly low radiation level.

17. *Q.* How many containers of plutonium or other fuel would have to be stolen in order for someone who stole them to assemble enough material to create a critical mass?

A. If the fuel assemblies were removed from the containers and arranged closely in water criticality could be achieved with assemblies from two containers (that is 4 assemblies).

18. *Q.* How many such containers will be shipped to the Vermont Yankee power plant over its expected useful life?

A. Assuming the plant will have a useful life of 30[1] years it is estimated that 1700 such containers would be shipped during that period.

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[1] This is a typographical error in the original and should read *"40"* instead of "30".

EXHIBIT V-A

Description of Model RA-1 Package Used For Vermont Yankee's First Fuel Assemblies

1.0 *Package Description — Packaging*

(a) General: A right rectangular box consisting of a wooden outer container and a metal inner container separated by cushioning material.

(b) Gross Weight: 2800 pounds.

(c) Containment Vessel: A metal box consisting of an outer shell and perforated inner basket separated by structural angle iron. Outer shell formed of 16-gauge carbon steel plate with an integral welded end of same material. Four ⅛" thick one-inch angle stiffeners are welded on 4" centers to the outer surface of the end plate. Approximate dimensions 9" high, 18" wide and 174" long.

Inner basket of 16-gauge steel plate with ¾" perforations on 1¾" centers welded to upper edge of outer shell to form two U-shaped channels 6⅞" square which may be lined with cemented low-density cushioning with perforations matching size and location of those in basket.

Inner basket supported within inner shell by four ⅛" thick 3" x 3" angle iron spacers positioned longitudinally along entire length of body. Cover and end cap constructed similar to the box to provide 2" annulus around fuel when closed except at ends. A manually operable pressure relief valve passes 2 cfm air automatically at .5 psi pressure difference. Gasket of ½" thick hollow neoprene provides full seal with cover in place. Closure

effected by latches ("Camloc", 3711 series or equivalent) which are inaccessible during transport.

(d) Outer Container: Box 33" high, 32" wide and up to 207" long fabricated of ½" plywood, 2 x 4 cleated, on 2 x 6 tongue and groove platform with bolted 4 x 4 skids.

(e) Internal Cushioning: Three 3" layers of ⅜" cell phenolic resin impregnated kraft fiber honeycomb line the box at ends; one layer at top, bottom and sides. Remaining space at ends filled with expanded polyethylene cushioning. Three-inch-thick, 12" wide pads of same material centered over transverse skids at sides, top and bottom. No attached lifting or tiedown devices.

2.0 *Package Evaluation*

A sample Model RA-1 package was subjected to the tests or assessments set forth in Subpart C of 10 CFR 71. Results of these tests and assessments were submitted for the AEC's review as part of the fuel manufacturer's application for an amendment to its special nuclear materials license for authorization to use container Model RA-1 for shipments of fuel assemblies. This evaluation data is given below.

2.1 General

There are no components of the packaging or its contents which are subject to chemical reaction in normal transportation environment. The package cannot be opened inadvertently, uses no coolant, and has no lifting devices or tiedown attachments.

2.2 Normal Transport Conditions

(a) *Thermal* — None of the components of the fuel assemblies or the inner metal container on which containment integrity and nuclear safety depend are significantly affected by temperatures within the range of −40°F to 130°F.

(b) *Pressure* — The breather valve opens automatically when the inner container is subjected to ∓.5 psi pressure differential. Therefore there is no effect on the packaging from an environment of .5 atmosphere.

(c) *Vibration* — A 6″ thick layer of cushioning material surrounds the inner metal container at the sides, top and bottom with an additional 3″ thickness at the ends. The Ethafoam cushioning is slightly compressed in final closure and banding of the outer container and is therefore not free to shift during transport. Since the latches on the metal container are pinned they cannot loosen during normal transport vibration or shock even were such vibration able to penetrate the cushioning material.

(d) *Water Spray and Drop Tests* — The complete package is designed to protect the fuel assemblies within the inner metal container from loss of containment integrity or change in nuclear safety reliability by virtue of the thick cushioning material surrounding it. The shock absorbing qualities of this material and of the heavy wooden cleats at the corners, edges and at all joints in the plywood, supplemented by the inherent resiliency of nails and

steel bands used in final closure of the outer package constitute a more than adequate buffer against the subject tests. This conclusion is further supported by analysis of high speed motion pictures recorded during the 30-ft drop test, described in Section 3.0, in which the flexibility of the package under impact is clearly evident.

(e) *Penetration* — Tests were conducted in which the flat circular end of a vertical steel cylinder 1¼″ in diameter weighing 13 lbs. was dropped four feet onto the center of the ½″ plywood outer container. No damage resulted after four drop tests.

(f) *Compression* — Tests were conducted in which six loaded packages were stacked. There was no visible nor measurable damage to the container on the bottom of the stack.

(g) *Reactivity* — In the normally undamaged condition, fuel assemblies are dry. Consideration was given to the effect of the hydrogenous outer packaging materials between adjacent metal containers. However, the analysis of water immersion of an infinite array of packages without water inside the inner container, described in detail in Section 3.1 below, demonstrates that condition would produce a more reactive array than the as-shipped condition. Results of conservative calculations of the as-shipped condition indicate a value for k_∞ of 0.8. This seemingly high value is partially explained by the degree of moderation of the packaging material and partially by the

conservative approximations, e.g., greater fuel size and assembly reactivity, than will actually be shipped. The criticality analysis conclusively demonstrates substantial subcriticality under all of the conditions of temperature, pressure, puncture, impact and exposure to incidental water during anticipated maximum potential damaging conditions of normal transport.

3.0 *Accident Evaluation*

3.1 Free Drop Test

Height:	30 ft. measured by weighted string hung from package.
Attitude of impact:	Long axis about 25° from vertical.
Impact surface of package:	Top edge of end which has the clamped end cap on the inner package. (From a series of drop tests of an earlier prototype, it was clearly established that the end cap and cover edge was the most vulnerable impact attitude. Previous drops also included flat on the cover surface and flat on the bottom.
Surface struck:	18″ thick concrete pad. Pad not damaged by test drop.
Contents:	Two simulated fuel assemblies each fabricated of ¾″ diameter steel rods 157″ long over a wood core and welded to typical reactor fuel assembly hardware at both ends. Dummy dimensions: 6″ x 6″ x 174″ long; weight 632 lbs. each.

Results:	Damage confined to impacted area. End of outer box separated from body exposing inner container but inner container still in position in outer container. End cap of inner container was still latched but gasketed surface not in contact with shell flange along one edge of end cap. Subsequent immersion would have permitted water leakage into inner container. End cap had to be unlatched and pried off with a tool in order to permit subsequent removal of cover and fuel assemblies. Two-inch annulus remained intact except in a 5″ long area at one end of the cover where resulting space averaged about one inch; an insignificant (1) portion of the total container surface.

3.2 Puncture Test

In view of the fact that the inner metal container remained firmly within the outer packaging and, since the inner package was properly designed to remain subcritical with water inleakage such as that which could result from a puncture, an actual puncture test was not conducted.

3.3 Thermal Test

An actual thermal test was not conducted but the outer packaging and cushioning material was assumed to

be completely consumed under thermal test conditions. However, the remaining inner package is constructed of noncombustible material and the minimum melting point of the fuel material is 4360°F. The pressure relief valve permits escape of heated air from the metal container. Therefore, this device would prevent rupture of the container even if the gasket did not melt to allow pressure relief. The 18-gauge steel container is internally braced with lengthwise angle iron on both sides and bottom; the cover is similarly braced. Previous tests of an 18-gauge 55-gallon drum in a jet fuel fire which exceeded an exposure temperature of 1475°F for more than 30 minutes produced no melting or distortion of the outer surface. It is therefore concluded that a similar thermal test at 1475°F for 30 minutes would result in no damage to the Model RA-1 container nor its contents more severe than the assumed conditions considered in the criticality analysis presented below.

3.4 Water Immersion Test

Since the package is designed to remain subcritical assuming any degree or credible mode of water inleakage, it was unnecessary to subject the package to an immersion test.

3.5 Analysis of Damaged Packages

From the above tests and assessments, the damaged package is assumed to be as follows:

(a) All materials outside of the inner metal container have been consumed by fire or otherwise removed.

(b) Package contents (fuel assemblies) remain inside the metal container.

(c) Metal container retains an annulus approximately 2″ thick around the fuel assemblies.

(d) The assemblies are of the most reactive type which could be shipped under the authorization requested herein, i.e., 5½″ square cross-section, 64 rods of 0.580″ diameter clad in 0.020″ zirconium at 5% U-235 enrichment. The geometric buckling of a reflected two-assembly container is 0.0188.

(e) The k_∞ value of the assembly defined above is taken at 1.54. This value is conservative since the value used for design of fuel storage facilities including storage pools is 1.4; maximum k_∞ values for presently planned fuel are approximately 1.3.

Based on the above factors, two cases were analyzed, namely, the flooded and nonflooded inner package. If the metal containers were flooded with water and closely "stacked" in an infinitely-large, three-dimensional array, the calculated k_∞ value would be .954; a 250 container array would have a calculated k_∞ value of 0.943. Assuming, more conservatively, the annulus thickness had in some manner been reduced over the entire surface of 250 containers from 2 to 1.5 inches, the array would still be subcritical.

In the second case, it was assumed that the metal containers were submerged in, or sprayed with, water but did not permit inleakage. Considering differing degrees of water moderation that could result from differing degrees of separation between

packages, a maximum k_∞ value of approximately 0.93 was calculated at the most reactive spacing of about 0.15 inches. The following table indicates values over the range of analysis:

Inches of water between containers	Value of k_∞ (Calculated)
0	.71
.15	.93
.50	.78
1.00	.69
1.50	.53

These calculations considered effects of interspersed moderation between the containers over a sufficiently wide range of moderation to demonstrate subcriticality under all credible conditions.

Calculative methods incorporated standard reactor design techniques utilizing Muft-type slowing down calculations with heterogeneous corrections to obtain two-group averaged epithermal cross-sections. Cross-sections averaged over the thermal range were obtained from solutions of the Wilkins equation combined with a P-3 approximation to the Boltzman equation. Accuracy of these techniques for systems of this type has been well demonstrated by reactor operating experience and other experimental data for similar systems. These methods are described in detail in Section 5 of the applications for license filed under these dockets.

Thus, regardless of whether water were present as the result of a spray, through immersion, or for any other reason, the fuel assemblies would remain subcritical in any number. This same calculation demon-

strates subcriticality also for the "as-shipped" packages in which the wood and plastic material, either wet or dry, contributes a certain degree of moderation because of its hydrogen content.

In summary, therefore, an infinite number of packages, either in the damaged condition or undamaged but in a water environment, would remain subcritical in any arrangement.

Supplementary Information

IV TRANSPORTATION: HIGH LEVEL WASTES FROM THE PLANT

I. *Basic Information*

Waste material will be in several forms at the Vermont Yankee plant. The largest source of waste material and the only source of high level waste material will be the spent fuel. Water treatment resins are used in various plant process streams to purify and remove radioactive constituents from them. The major portion of these exhausted resins are low activity. Other smaller quantities of miscellaneous radioactive wastes consisting of rags, floor sweepings, worn out equipment and paper will also require disposal. These items and their disposal will be discussed individually.

II. *Spent Fuel*

A. Description

The majority of all waste materials are contained within the spent fuel assemblies and are shipped intact to the reprocessor. The physical dimensions of a spent fuel assembly are identical to a new fuel assembly; about 14½ feet long x 5.4 inches square and weigh about 500[1] pounds. Over the 30-year lifetime of the plant, about 2600 fuel assemblies will be used and require shipment to a reprocessor; this is equivalent to approximately 3500 cubic feet and 1,300,000[2] pounds of waste material.

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[1] This is a typographical error in the original and should read *"680"* instead of "500". See FSAR (*Ex.* 1) §1.7, Table 1-7-1.

See also *supra* at A-26.

[2] This is a typographical error in the original and should read *"1,800,000"* instead of "1,300,000."

B. Spent Fuel Shipping Cask

Vermont Yankee intends to let a contract for the shipment of spent fuel and, if possible, to include the reprocessing in the same contract. The casks which will be used to transport the spent fuel are not known at this time so that only general design features can be discussed. The cask will be a large steel, lead and possibly depleted uranium shielded cask. If truck shipment is used, the cask will weigh in the neighborhood of 30 tons and one cask per truck will be shipped. A rail cask may weigh upwards of 100 tons and only one would be sent in each train. A truck cask could hold up to 6-8 spent fuel assemblies, while a rail cask would hold up to 20 assemblies. The cask will be designed and built to conform to all applicable regulations of the AEC and DOT in effect at that time. Present design conditions include the requirement to survive intact without leakage a 30-foot free fall and a 1475° fire for 30 minutes. Depending upon cask size, between 130-430 shipments may be anticipated over the life of the plant.

III. *Spent Resins*

A. Description

The Powdex resin is utilized at Vermont Yankee for system cleanup. The resins are finely divided solid particles which remove unwanted particulate matter by filtration and soluble ions by the ion exchange process. Approximately 1500-1800 cubic feet of this resin will be used annually at Vermont Yankee. All but about 65 feet of this will be relatively low level, approximately 0.3 curies per cubic foot. The remaining 65 cubic feet per year will be somewhat higher in activity and could approach 15 curies per cubic foot. Cobalt is expected to be major radioactive isotope present in this material when it is shipped. Co-58 is ex-

pected to make up 80-95% of the activity and Co-60 the remainder. When a resin bed becomes exhausted (usually chemically and not radioactively), water is added to make a slurry and it is pumped to the waste disposal area of the plant where a centrifuge will remove the excess water. Directly below the centrifuge is the resin shipping cask into which the resins are piped and remain until the cask is full. The resins in the cask with the free water removed would have a consistency quite similar to wet concrete.

B. Cask Description

Vermont Yankee is in the process of entering into a contract for waste disposal service in which the shipping casks will be supplied and the shipping and disposal handled by the contractor.

Two shipping casks will be utilized by Vermont Yankee, one heavily shielded cask of relatively low volume for the higher activity resins and a larger moderately shielded one for the lower activity resins.

The first cask consists of 1 inch structural steel shell, 3¾ inches of lead shielding, and ⅜ inch steel inner shell. The inner shell is designed as a pressure vessel to withstand 400 psi, although it is normally unpressurized. The cask is approximately 5½ feet in diameter and 5½ feet high and weighs a total of 45,000 pounds loaded. The total useable volume for waste is about 70 cubic feet. An additional disposable steel liner is placed within the cask prior to the resin loading operation.

Loading is accomplished through a small diameter hole in the center of the inner liner. When the cask is filled, the inner disposable leak tight liner is sealed with a non-removable cap prior to shipment. Depending upon the isotopes present, this cask can safely contain up to 3500

curies of waste. It is estimated that one shipment per year will be made with this cask.

The second cask has all the same design features of the first cask but is larger in outside dimensions, has about 1 inch of lead shielding, and will accept an inner liner of about 160 cubic feet capacity. The total loaded weight is also about 45,000 pounds. The dimensions of this cask are 7 feet in diameter and 7 feet high. It is designed to safely transport up to 185 curies of low specific activity waste, depending upon its isotopic makeup. Approximately 7-10 shipments per year will be made with this cask.

C. Transportation

Both of these casks are intended for truck transportation. One design limitation placed upon them is that the loaded cask trailer, tie-down devices, tractor and associated equipment will not exceed maximum legal weight limit for over-the-road transportation. This limit is presently 73,280 pounds. A single cask will be placed in the center of the trailer and firmly anchored in place. One cask per truck is all that can be transported.

IV. *Miscellaneous Wastes*

These wastes will be the normal wastes found around any machine shop, except they have the potential of being slightly contaminated with radioactive material. The normal procedure will be to place these wastes in open-top 55-gallon drums and sealing them when they are full. Normally these drums will be of such low activity that the waste disposal contractor would take them along with one of the larger casks for disposal. However, the larger shipping casks described previously are designed to accept a number of 55-gallon drums, so that shipments of higher activity drums will be shipped in an adequately shielded

container. The annual shipments are subject to variation, but they should not exceed 50 drums per year.

QUESTION IV.1

How many containers of waste materials, assuming the use of presently planned containers, will have to be shipped from the plant to some other location during the useful life of the plant?

ANSWER IV.1

Vermont Yankee estimates between 370 to 760 containers will be shipped over the 30-year life-time of the plant. Refer to Section II.B, III.B and IV of the Supplementary Information for the details.

QUESTION IV.2

Assuming present shipping arrangements, how many shipments of waste containers by truck will have to be made over the useful life of the plant? How many shipments by train?

ANSWER IV.2

Rail utilization would mean approximately 130 rail shipments and 570 truck shipments. If only trucks are used, approximately 760 shipments would be made. Refer to Sections II.B, III.B and IV of the Supplementary Information for details.

QUESTION IV.3

Describe in detail the package in which high level radioactive wastes will be transported to the reprocessing plant, or disposal site or both, if both apply. Include size, weight, and markings of the container, and a description of any systems in the container which will be required because of

the chemical and radiological composition of the waste materials.

ANSWER IV.3

Refer to Sections II B and III B of the supplementary information.

QUESTION IV.4

What physical state — e.g., solid or liquid — will the waste materials be in when they are transported?

ANSWER IV.4

Refer to Sections II A, III A and IV of the supplementary information.

QUESTION IV.5

What is the capacity of each container, and, if there is any difference, how much waste material will normally be shipped in each container?

ANSWER IV.5

Refer to Sections II B and III B of the supplementary information.

QUESTION IV.6

How many containers will be shipped on each truck or train, whichever applies (if both will be used, answer for both and indicate percentage of containers which will be shipped each way)?

ANSWER IV.6

Only one cask is sent per shipment, either truck or rail. The percentage is not known. Refer to Sections II.B and III.C of the Supplementary Information.

QUESTION IV.7

Describe in detail the chemical and radiological composition of the high level wastes. Include the following, and whatever else is relevant:

a.) What toxic chemicals will be present in the material shipped to the reprocessing plant, in what quantities, and proportions of the total material shipped in the container?

b.) What radioisotopes will be present in the material? List, with respect to the major ones:

1. The total mass of each isotope within the container;
2. the proportion of this mass to the total mass of the material within the container;
3. the total radioactivity (in appropriate units) accounted for by this isotope;
4. the proportion of this radioactivity in the same units to the total radioactivity within the container;
5. the half-lives of each isotope described.

c.) What is the total radioactivity (in appropriate units) which will be contained in each waste container?

ANSWER IV.7

a.) No toxic chemicals will be shipped with any of the waste material.

b.) With respect to spent fuel, attached is a table of the fission product inventory after 90 days decay, which is the minimum cooling time prior to shipment. The

table of significant radionuclides presented in response to Question II.1.(d) is also applicable here.

With respect to spent resins, refer to Section III.A of the Supplementary Information for the major radionuclides. The mass of radionuclides in comparison with the total mass is extremely small and has not been calculated. The half life of cobalt 60 is 5.3 years and the half life of cobalt 58 is 71.4 days.

c.) Refer to the table of fission product inventory after 90 days decay. This accounts for essentially all of the activity present in a single fuel assembly. The heavily shielded resin shipping container is not expected to contain more than 300 curies of Vermont Yankee wastes, and the moderately shielded cask is not expected to contain more than 50 curies of Vermont Yankee wastes.

VERMONT YANKEE
FISSION PRODUCT INVENTORY

1 Spent Fuel Assembly
90 Days Decay

NUMBER	ISOTOPE	HALF-LIFE (SEC.)	CURIES AFTER 90 DAY DECAY	RATIO TO TOTAL
1	BR83	0.829E 04	0.000E 00	0.000E 00
2	BR84	0.198E 04	0.000E 00	0.000E 00
3	BR85	0.180E 03	0.000E 00	0.000E 00
4	BR87	0.563E 02	0.000E 00	0.000E 00
5	I129	0.505E 15	0.433E–02	0.485E–08
6	I31A	0.695E 06	0.423E 02	0.474E–04
7	I31B	0.695E 06	0.659E 01	0.738E–05
8	I132	0.828E 04	0.763E–03	0.855E–09
9	I133	0.755E 05	0.275E–25	0.308E–31
10	I134	0.315E 04	0.000E 00	0.000E 00
11	I135	0.241E 05	0.000E 00	0.000E 00
12	I136	0.840E 02	0.000E 00	0.000E 00
13	KR3M	0.686E 04	0.000E 00	0.000E 00
14	KR5M	0.158E 05	0.000E 00	0.000E 00
15	KR85	0.334E 09	0.164E 04	0.184E–02
16	KR87	0.468E 04	0.000E 00	0.000E 00
17	KR88	0.100E 05	0.000E 00	0.000E 00
18	KR89	0.192E 03	0.000E 00	0.000E 00
19	XE1M	0.103E 07	0.104E 02	0.116E–04
20	XE3M	0.198E 06	0.161E–07	0.180E–13
21	XE33	0.459E 06	0.242E 01	0.271E–05
22	XE5M	0.935E 03	0.000E 00	0.000E 00
23	XE35	0.326E 05	0.000E 00	0.000E 00
24	XE37	0.234E 03	0.000E 00	0.000E 00
25	XE38	0.101E 04	0.000E 00	0.000E 00
26	SE81	0.108E 04	0.000E 00	0.000E 00
27	SE3M	0.672E 02	0.000E 00	0.000E 00
28	SE83	0.150E 04	0.000E 00	0.000E 00
29	SE84	0.119E 03	0.000E 00	0.000E 00
30	RB88	0.108E 04	0.000E 00	0.000E 00
31	RB89	0.900E 03	0.000E 00	0.000E 00
32	RB90	0.161E 03	0.000E 00	0.000E 00

NUMBER	ISOTOPE	HALF-LIFE (SEC.)	CURIES AFTER 90 DAY DECAY	RATIO TO TOTAL
33	RB91	0.840E 03	0.000E 00	0.000E 00
34	RB92	0.800E 02	0.000E 00	0.000E 00
35	SR89	0.441E 07	0.535E 05	0.600E–01
36	SR90	0.884E 09	0.144E 05	0.162E–01
37	SR91	0.350E 05	0.000E 00	0.000E 00
38	SR92	0.972E 04	0.000E 00	0.000E 00
39	SR93	0.420E 03	0.000E 00	0.000E 00
40	SR94	0.119E 03	0.000E 00	0.000E 00
41	Y90	0.230E 06	0.144E 05	0.162E–01
42	Y91M	0.300E 04	0.000E 00	0.000E 00
43	Y91	0.529E 07	0.818E 05	0.916E–01
44	Y92	0.129E 05	0.000E 00	0.000E 00
45	Y93	0.359E 05	0.000E 00	0.000E 00
46	Y94	0.990E 03	0.000E 00	0.000E 00
47	Y95	0.630E 03	0.000E 00	0.000E 00
48	ZR95	0.563E 07	0.909E 05	0.101E 00
49	ZR97	0.613E 05	0.155E–32	0.174E–38
50	NB5M	0.323E 06	0.186E 04	0.209E–02
51	NB95	0.302E 07	0.155E 06	0.173E 00
52	NB7M	0.597E 02	0.152E–32	0.171E–38
53	NB97	0.444E 04	0.170E–32	0.190E–38
54	MO99	0.244E 06	0.652E–04	0.731E–10
55	MO01	0.900E 03	0.000E 00	0.000E 00
56	MO02	0.693E 03	0.000E 00	0.000E 00
57	MO05	0.119E 03	0.000E 00	0.000E 00
58	TC9M	0.215E 05	0.626E–04	0.702E–10
59	TC01	0.857E 03	0.000E 00	0.000E 00
60	TC2A	0.498E 01	0.000E 00	0.000E 00
61	TC2B	0.269E 03	0.000E 00	0.000E 00
62	TC05	0.597E 03	0.000E 00	0.000E 00
63	RU03	0.344E 07	0.239E 05	0.268E–01
64	RU05	0.161E 05	0.000E 00	0.000E 00
65	RU06	0.315E 08	0.108E 05	0.121E–01
66	RU07	0.287E 03	0.000E 00	0.000E 00
67	RH3M	0.341E 04	0.240E 05	0.269E–01
68	RH5M	0.450E 02	0.000E 00	0.000E 00
69	RH05	0.126E 06	0.983E–14	0.110E–19
70	RH06	0.300E 02	0.109E 05	0.122E–01

NUMBER	ISOTOPE	HALF-LIFE (SEC.)	CURIES AFTER 90 DAY DECAY	RATIO TO TOTAL
71	RH07	0.131E 04	0.000E 00	0.000E 00
72	SN27	0.741E 04	0.000E 00	0.000E 00
73	SN28	0.341E 04	0.000E 00	0.000E 00
74	SN30	0.156E 03	0.000E 00	0.000E 00
75	SB27	0.319E 06	0.251E–03	0.281E–09
76	SB28	0.597E 03	0.000E 00	0.000E 00
77	SB29	0.151E 05	0.000E 00	0.000E 00
78	SB30	0.597E 03	0.000E 00	0.000E 00
79	SB31	0.138E 04	0.000E 00	0.000E 00
80	SB32	0.126E 03	0.000E 00	0.000E 00
81	SB33	0.245E 03	0.000E 00	0.000E 00
82	TE7M	0.907E 07	0.763E 03	0.855E–03
83	TE7A	0.338E 05	0.220E–03	0.247E–09
84	TE7B	0.341E 05	0.443E 03	0.497E–03
85	TE9M	0.285E 07	0.202E 04	0.227E–02
86	TE9A	0.372E 04	0.000E 00	0.000E 00
87	TE9B	0.372E 04	0.202E 04	0.226E–02
88	TE1M	0.103E 06	0.434E–18	0.487E–24
89	TE1A	0.150E 04	0.000E 00	0.000E 00
90	TE1B	0.150E 04	0.989E–19	0.110E–24
91	TE32	0.280E 06	0.740E–03	0.830E–09
92	TE3M	0.378E 04	0.000E 00	0.000E 00
93	TE33	0.120E 03	0.000E 00	0.000E 00
94	TE34	0.263E 04	0.000E 00	0.000E 00
95	CS37	0.946E 09	0.144E 05	0.161E–01
96	CS38	0.192E 04	0.000E 00	0.000E 00
97	CS39	0.568E 03	0.000E 00	0.000E 00
98	CS40	0.660E 02	0.000E 00	0.000E 00
99	CS42	0.597E 02	0.000E 00	0.000E 00
100	BA7M	0.156E 03	0.134E 05	0.151E–01
101	BA39	0.509E 04	0.000E 00	0.000E 00
102	BA40	0.110E 07	0.183E 04	0.205E–02
103	BA41	0.107E 04	0.000E 00	0.000E 00
104	BA42	0.660E 03	0.000E 00	0.000E 00
105	LA40	0.144E 06	0.212E 04	0.238E–02
106	LA41	0.136E 05	0.000E 00	0.000E 00
107	LA42	0.509E 04	0.000E 00	0.000E 00
108	LA43	0.114E 04	0.000E 00	0.000E 00

NUMBER	ISOTOPE	HALF-LIFE (SEC.)	CURIES AFTER 90 DAY DECAY	RATIO TO TOTAL
109	CE41	0.276E 07	0.332E 05	0.372E–01
110	CE43	0.118E 06	0.466E–14	0.523E–20
111	CE44	0.246E 08	0.150E 06	0.169E 00
112	CE45	0.180E 03	0.000E 00	0.000E 00
113	CE46	0.840E 03	0.000E 00	0.000E 00
114	PR43	0.120E 07	0.289E 04	0.324E–02
115	PR44	0.105E 04	0.151E 06	0.169E 00
116	PR45	0.215E 05	0.000E 00	0.000E 00
117	PR46	0.144E 04	0.000E 00	0.000E 00
118	ND47	0.100E 07	0.384E 03	0.431E–03
119	ND49	0.719E 04	0.000E 00	0.000E 00
120	ND51	0.900E 03	0.000E 00	0.000E 00
121	PM47	0.794E 08	0.239E 05	0.369E–01
122	PM49	0.194E 06	0.362E–07	0.405E–13
123	PM51	0.100E 06	0.965E–19	0.108E–24
124	SM51	0.230E 10	0.114E 02	0.128E–04
125	SM53	0.169E 06	0.859E–10	0.963E–16

TOTAL = 0.8923E 06

QUESTION IV.8

What impact would the chemical compounds described above, in the quantities which will be present in each container, have on the environment, including human beings, if they escaped from the container by accident, sabotage, or other means?

ANSWER IV.8

Not applicable.

QUESTION IV.9

What impact would the radioactivity described above, in the quantities which will be present in each container, have on the environment, including human beings, if they escaped from the container by accident, sabotage, or other means?

ANSWER IV.9

It is difficult to envision an act that would permit the escape of radioactivity from a cask. The casks themselves are rugged pieces of equipment. Casks must be designed to withstand a 30-foot free-fall drop onto any unyielding surface and a fire of 1475°F for 30 minutes without loss of contents. In the case of spent fuel, even if the cask is breached, the fuel cladding must also fail to have any release. If this were to occur, the small fraction of iodines, xenons and kryptons contained in the fuel pellet gap, would escape to the surroundings. The major constituent of any postulated release would be krypton-85 and its release would be far less than the 100 curie limit allowed in the DOT regulation.* Release of this amount of activity should result in no measurable impact on this environment. The activity in the resin shipments is chemically bound to the resin particles so that release of the resins will not cause dispersal of the activity. Cleanup of this material might be tedious but would not be hazardous to the environment.

QUESTION IV.10

Answer the previous two questions with respect to the quantities of chemicals and radioactivity which will be present in a typical *shipment* of waste material — by truck or train, or both, if both are to be used.

ANSWER IV.10

Refer to the response to Question IV.8 and IV.9 above as each *shipment* will consist of only one *container* (cask).

QUESTION IV.11

By what route or routes will containers of waste materials be taken from the Vermont Yankee plant to the re-

*Tariff No. 23, Hazardous Materials Regulations of the Department of Transportation, section 173.389(c)(1)(ii). [*This footnote in original*]

processing plant or disposal site, whichever applies? Designate:

a.) The roads which will be used, by route numbers;

b.) The cities through which the containers will pass;

c.) The number of stops expected and the places where they are expected to be made;

d.) The train tracks which will be used, if any, specifying clearly where they are.

ANSWER IV.11

Vermont Yankee does not know the travel routes to be used.

QUESTION IV.12

What, if any, calculations or studies have been done to determine the chances of an accident involving waste-carrying trucks or trains from the Vermont Yankee plant over the course of its useful life? If such calculations or studies have been made, supply them and indicate their conclusions.

ANSWER IV.12

No accident studies have been made for Vermont Yankee.

QUESTION IV.13

What, if any, studies have been done to learn the chances that a waste container might burst open in the event of a collision or accident involving a truck or train transporting the wastes?

ANSWER IV.13

Vermont Yankee knows of no specific studies performed to evaluate the probability of damage to a shipping container in transit.

QUESTION IV.14

Have any of these tests been conducted under conditions approximating actual conditions — involving dropping containers from moving trucks or trains, for example — as opposed to testing with standard laboratory bursting and puncture tests? Supply copies and summarize results.

ANSWER IV.14

Vermont Yankee knows of no tests being performed with full-sized containers under real accident conditions.

QUESTION IV.15

What, if any, calculations or studies have been done to determine the liklihood of attempted sabotage or hijacking of a truck or train carrying waste from Vermont Yankee during the useful life of the plant? If such studies have been done, supply them and indicate their conclusions.

ANSWER IV.15

Vermont Yankee knows of no studies that have been performed in this area.

QUESTION IV.16

Is it possible to obtain a critical mass with any isotope or isotopes or combination of isotopes and other materials which will routinely be present in the high level waste shipments being shipped from Vermont Yankee Nuclear plant? If so, specify all such isotopes and/or combinations of isotopes and other materials.

ANSWER IV.16

Reactor fuel is used until it no longer is capable of producing a critical mass. Once the fuel is removed from the reactor and allowed to decay for 90 days, it may be possible to obtain a critical mass with fuel and water at room temperature. As mentioned in response to Question V.17, it would require four fresh fuel assemblies arranged closely in water to obtain a critical mass; the number of spent assemblies to obtain a critical mass is dependent upon burnup. No calculations have been made, but an estimate would be at least six spent assemblies closely arranged in water would be required. The isotopes involved are those of uranium and plutonium.

QUESTION IV.17

If the answer to any part of Question 16 is yes, how many containers of high level wastes would be required to obtain enough material to obtain a critical mass?

ANSWER IV.17

The number of containers (casks) is dependent upon the size of the container. One large rail cask would contain a sufficient number of assemblies. The truck cask might contain a sufficient number of spent fuel assemblies, but its exact size (and hence capacity) is not known at this time.

QUESTION IV.18

If the answer to any part of Question 16 is yes, is a theft of enough waste material to produce a critical mass a credible possibility? If the answer is no, explain in detail why not, including information as to precautions to be taken to prevent such a theft. Supply studies relied upon.

ANSWER IV.18

No. Vermont Yankee considers that the attendent problems associated with the handling of spent reactor fuel removes this act from the relm of credibility.

QUESTION IV.19

What is the approximate value, in dollars, in America, of the radioactive material which will be contained in each con-

tainer of high level waste materials? On the international market?

ANSWER IV.19

As mentioned in previous responses, the number of fuel assemblies in each shipment is not known at this time, but is estimated to be between 6 and 20, dependent upon truck or rail cask utilization. At present, the only radio-isotopes of value are those of uranium and plutonium, which are fissile. The spent fuel is considered worthless until reprocessed. The following prices are for the fissile materials present in one spent assembly after separation but does not include the cost of reprocessing.

Fissile Element	American Market	International Market
Plutonium	$7,000	$10,000
Uranium	$8,000	<$ 8,000

QUESTION IV.20

What, if any, calculations or studies have been made of the expected future loss of radioactive material, as a percentage of the total transported, over the useful life of the plant? Supply the study, or studies, and its/their conclusion(s).

ANSWER IV.20

No calculations or studies have been made.

QUESTION IV.21

If such calculations have been made, how much of this "lost" material is expected to be disseminated into the environment? What is the basis for this estimate, if any? Supply the relevant study or studies.

ANSWER IV.21

Not applicable.

QUESTION IV.22

What would be the effect on the environment, including human beings, of the dissemination of this material into the environment? Supply relevant studies, if any, and their conclusions.

ANSWER IV.22

Not applicable.

IV. DISPOSAL OF HIGH LEVEL WASTES

QUESTION IV.(DIS)*.1

Where will high level radioactive wastes from the Vermont Yankee plant be disposed of? If the site or method of disposal is expected to change during the useful life of the plant, specify with respect to each expected site or method and period.

ANSWER IV.(DIS).1

Refer to the response to Question I.7 for the spent fuel. The other wastes will go to a federally licensed disposal site, which is responsible for ultimate disposal.

QUESTION IV.(DIS).2

What is the total volume and mass of the high level waste materials to be shipped from the plant over its useful life?

ANSWER IV.(DIS).2

The total volume will be approximately 10,000[1] cubic feet and weigh approximately 3,750,000[2] pounds. Refer to Sec-

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Section IV. [*This note in original*]

*DISPOSAL OF HIGH LEVEL WASTES. [*This note in original*]

[1] This is an error in the original and should read *"3,500"* instead of "10,000". See *supra* at A-45.

[2] This is an error in the original and should read *"1,800,000"* instead of "3,750,000". See *supra* at A-45.

tions II.A, III.A and IV of the Supplementary Information for details.

QUESTION IV.(DIS).3

What is the total amount of radioactivity (in appropriate units of radioactivity) with a half-life over 20 years which will be produced at the plant over its useful life?

ANSWER IV.(DIS).3

Assuming that the reactor core will be replaced an equivalent of 7½ times over the 30-year lifetime of the plant, the following quantities of fission products with the half-lives greater than 20 years will be produced.

Isotope	30-year Total (Ci)
I-129	1.19×10^{1}
Sr-90	4.00×10^{7}
Cs-137	3.98×10^{7}
Sm-151	3.03×10^{4}

In addition to the above, it is estimated that 1.3×10^{5} curies of uranium and plutonium will be present in all the spent fuel used in this period.

QUESTION IV.(DIS).4

What physical state will these wastes be in when they are disposed of?

ANSWER IV.(DIS).4

Refer to Supplementary Information sections II and III.

QUESTION IV.(DIS).5

If it is intended that at some time during the life of the Vermont Yankee plant the high level wastes are to be disposed of in solid form, when is it expected that this process will be in operation?

ANSWER IV.(DIS).5

Refer to Answer IV.(DIS).4.

QUESTION IV.(DIS).6

If the wastes are expected to be solidified at some point during the useful life of the plant?

a.) Describe the process by which the wastes are to be solidified.

b.) Describe the chemical composition of the solid to be manufactured.

c.) Describe the physical properties of the solid to be manufactured, including, but not limited to, its melting temperature, rate of expension with temperature, and resistence to destruction from forces applied to it gradually and suddenly.

ANSWER IV.(DIS).6

Refer to Answer IV.(DIS).4.

Vermont Yankee does not anticipate changing the state of the wastes (as described in Supplementary Information sections II and III) during the useful life of the plant.

QUESTION IV.(DIS).7

If the wastes are to be disposed of in liquid form at some time during the life of the plant:

a.) Describe the physical, chemical, and radiological characteristics of the liquid.

b.) Describe the method of disposal (e.g., in tanks, injection into bedrock, etc.) to be used for the material.

ANSWER IV.(DIS).7

As far as Vermont Yankee knows, no high level wastes are disposed of in liquid form, nor is it proposed for the

future. All high level wastes are solids or fixed in some manner prior to ultimate disposal.

QUESTION IV.(DIS).8

Answer the following questions with respect to disposal of both liquid and solid form high level wastes if both methods are to be used during the life of the plant; if both methods are not to be used, answer with respect only to the method to be used:

a.) Describe the containers into which the waste matter is put for disposal. Specify:

1.) the size of the container;

2.) the amount of waste material to be contained in each container, by weight, volume, and amount of radioactivity (using appropriate units of measurement);

3.) any shielding for protection from radioactivity which is built into the container;

4.) any devices or construction designed to control or dissipate heat from the waste material;

5.) any devices or construction designed to resist outside or inside pressure on the container;

6.) any devices or construction designed to prevent the release of the radioactive material to its immediate environment.

b.) Describe the facilities for storage of the containers for radioactive wastes.

c.) Describe the procedures for assuring that no radioactive wastes from these containers will escape into the environment at the site of the disposal facility.

d.) At what date in the future is it expected that these wastes will be harmless to human beings and other life?

e.) At what date in the future is it expected that security measures will no longer be needed to prevent human or other life from being endangered by the stored wastes?

f.) What studies, if any, have been made to determine how human and other life will be prevented from being endangered by these wastes during the period they are not harmless to life? Supply these studies, if any, and give their conclusions.

g.) With respect to the foregoing estimates, give estimates of the impact of each of these releases on the environment, including human life. Describe the probable route(s) through which such escaping materials would enter the environment, and through which they would travel. Supply any relevant studies upon which any conclusions are based.

h.) What strategies, if any, have been formulated to recapture any material escaping from the storage facility? Describe and supply relevant documents.

i.) How, if at all, can the storage facility be repaired should it become sufficiently impaired to release radioactive material? Describe and supply relevant documents.

ANSWER IV.(DIS).8

We are advised by legal council that in view of the Boards findings, no answer is required.

QUESTION IV.(DIS).9

What plans have been made for disposal of the highly contaminated structures associated with the reactor facility

at the end of its useful life? Describe and supply relevant documents.

ANSWER IV.(DIS).9

No plans have been made.

QUESTION IV.(DIS).10

What plans have been made for preventing damage to the environment, including human life, from the radioactive structures remaining on the site of the reactor at the end of its useful life? Describe and supply relevant documents.

ANSWER IV.(DIS).10

No plans have been made.

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

IN THE MATTER OF	DOCKET
VERMONT YANKEE NUCLEAR POWER CORPORATION	No. 50-271
(VERMONT YANKEE NUCLEAR POWER STATION)	

ORDER DENYING MOTION OF INTERVENOR NATURAL RESOURCES DEFENSE COUNCIL, INC. RESPECTING PREPARATION OF A NEW DETAILED STATEMENT OF ENVIRONMENTAL CONSIDERATIONS AND FOR REHEARING OF ORDER ON INTERROGATORIES

At the prehearing conference in this proceeding held on June 22, 1971, Intervenor Natural Resources Defense Council, Inc., filed a motion to require the preparation of a new detailed statement of environmental considerations and for a rehearing of Atomic Safety and Licensing Board's rulings with respect to contested interrogatories. Oral argument[1] was had respecting the motion which appears to be primarily directed to the environmental impact of nuclear waste material transportation, reprocessing and disposal. Movant contends that since a nuclear plant operation will produce nuclear waste material, the entire sequence of events following that production of waste material is within the scope of the issues assigned to the Atomic Safety and Licensing Board for determination. Movant contends that the National Environmental Policy Act (NEPA) requires that this issue be included in this proceeding and that

[1] Later, and on July 7, 1971, a brief by New England Coalition on Nuclear Pollution was filed in further support of the motion.

the detailed environmental statement, required by that Act, reflect these considerations.

At the oral argument, the Board noted that separate licensing procedures are prescribed by the Commission for the consideration of authority to undertake nuclear waste material transportation as well as separate procedures for reprocessing and disposal. The separate procedures imply different issues than would be pertinent for nuclear power plant operation.

The scope and effect of an environmental statement required by NEPA in relation to procedures provided by the Atomic Energy Commission, particularly Appendix D to 10 CFR Part 50 of the Commission's Regulations, are under consideration in the United States Court of Appeals, District of Columbia Circuit *In the Matter of Calvert Cliffs Coordinating Committee v. Atomic Energy Commission* (Case 24,871). This Atomic Safety and Licensing Board believes that it would not be in harmony with the quasi-judicial system to render a ruling granting the motion here involved while that Court decisional activity is underway. (See *California v. Federal Power Commission,* 369 U. S. 482 (1961).)

Insofar as the motion herein seeks a reconsideration of Board rulings concerning "certain interrogatories" to which objections were sustained by Order of the Board on May 11, 1971, it is the opinion of the Board that no additional facts have been asserted nor any different law advocated to warrant any different ruling than as shown in the Order of May 11, 1971, nor has adequate basis been shown to justify a certification of this motion to the Commission or to the Atomic Safety and Licensing Appeal Board.

WHEREFORE, in accordance with the Atomic Energy Act, as amended, and the Rules of Practice of the Commis-

sion, IT IS ORDERED that the aforesaid motion of Natural Resources Defense Council, Inc. be and it is denied.

ATOMIC SAFETY AND
LICENSING BOARD

By Samuel W. Jensch, *Chairman*

Issued:
July 20, 1971
Germantown, Maryland

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF:
VERMONT YANKEE NUCLEAR POWER CORPORATION
(VERMONT YANKEE NUCLEAR STATION)

DOCKET No. 50-271

Vermont National Guard Armory
Brattleboro, Vermont
Thursday, October 21, 1971

Hearing in the above-entitled matter was reconvened, pursuant to adjournment, at 9:00 a.m.

BEFORE:

SAMUEL W. JENSCH, Esq., Chairman,
Atomic Safety and Licensing Board.
DR. DAVID HALL, Member.
DR. IRA ZARTMAN, Member.

APPEARANCES:
(As heretofore noted.)

[2149]

low power consideration includes environmental matters, in fact they receive serious consideration. So we do have a lot involved besides the mechanics and the hardware for November 29 for low power testing.

If other attorneys are prepared and ready, and will so indicate to Applicant, we can have the necessary witnesses here and the other attorneys can go forward. But I think all attorneys should be prepared to use the week in whatever order is convenient to the attorneys. Because the Board finds it somewhat inconvenient to have fragmented hearings, but this is the best we can do.

Mr. Ayres, were you going to say something?

MR AYRES: Yes, I just wanted to ask one further question.

We have had so far no mention of the pending motion on waste disposal and transportation issue. I didn't know whether you wanted to bring that up. Basically I wanted to ask whether we could expect some kind of resolution of that between now and say the next session, so that we could prepare for the environmental session.

CHAIRMAN JENSCH: Let's give some consideration to that right now.

Have you received the so-called September letter from the Director of Regulation, which had included in the transmittal as I believe we discussed before, the unauthored, undated, and **[2150]** unsigned and without any reference to the Atomic Energy Commission, a statement that indicated the scope of matters for environmental statements?

In that transmittal it indicated that, as I understand Staff counsel the other day, that that does represent a Commission action. I wonder whether the Commission action has not thereby disposed of your motion as to which you may have objection and may want to preserve some record regarding it.

MR. AYRES: Mr. Chairman, maybe I am not clear on what you are saying, but we did submit an argument as a response to that, to the memo from the Staff, which included that September 1 unauthored memo. And it was our contention there that that was probably no sort of expression of

the Commission intention which should be given any credence, that it was made out well before the time when Appendix D was finally promulgated.

Given it was the impression of at least one of the groups that responded, namely, Vermont, that the Commission later expressed a different policy in a similarly informal way and given that in all of the formal expressions of position in Appendix D, the Commission appears to accept the position more like ours.

Now perhaps I am confused about what you are saying. Am I construing what you say as a ruling or not?

[2151]

CHAIRMAN JENSCH: No, I was inquiring for your discussion really. I wondered whether this item that was transmitted — it is dated September 1 — didn't dispose of the motion. I take it that it is your position that it does not because you say something transpired when Appendix D was issued on September 3, 1971 or was it September 9?

MR. AYRES: My position is that Appendix D is inconsistent with that letter. It seems also to me that that letter in itself is rendered less reliable by the counter-questions suggested by the State of Vermont, for example, in its response.

What I am saying is that what is at stake here is simply a question of authority.

Is it Appendix D that controls or some sort of very unclear, as to its legal status, memo, which was written before the Commission had come to a final conclusion, presumably therefore before the Commission had completely considered the question of what should be covered?

CHAIRMAN JENSCH: Can you refer to the particular part of the Appendix D to which you say overruled or

presents a different view than the September 1 memoranda included in Harold Price's letter of September 3?

MR AYRES: Appendix D, in Section 1 I believe or Section A, quotes essentially the language of the National Environmental Policy Act.

[2152]

Yes, it is Section A, paragraphs la and be for example, in Appendix D.

[2153]

CHAIRMAN JENSCH: Will you read that, please, for the record?

MR. AYRES: I don't have it before me. Just a moment. Well, it says it is a discussion of what either the supplemental or original environmental impact statement should include, pursuant to Appendix D.

And it describes, under section A-1, paragraph (a) what should go into — as one of the elements of what should go into that, the environmental impact of the proposed action, and paragraph (b) says "Any adverse environmental effects which cannot be avoided should the proposal be implemented."

Now, standing on its own, their own, neither of those might be considered clear, except for the fact that in both areas what is described is either "any" adverse effects or "all" of the environmental impact.

I think the meaning of those phrases is a lot clearer by virtue of Calvert Cliffs. It seems to me Appendix D is a response to the Calvert Cliffs, and that this language is no more than restating what the court said when it said that environmental impact statement should include "any and all" adverse effects.

It has been our contention all along and it remains so that the issues we would like to present to the Board are included within the meaning of any and all adverse effects.

CHAIRMAN JENSCH: I think one of the problems that **[2154]**
the Board has discussed in reference to that matter is what is the nuclear reprocessing plant that would be pertinent to this proceeding, assuming we gave consideration to that phase of the transportation?

MR. AYRES: Mr. Chairman, I think that is one question that has to be answered. We have no description so far of which one that might be.

CHAIRMAN JENSCH: Well, I think —

MR. AYRES: For all I know, it may be the problems are very common, that the dangers involved to the environment in the reprocessing at one plant or another are similar enough so that the Board can evaluate them from knowing basically what dangers are involved in any reprocessing of this sort of material, as it is presently expected to be done.

CHAIRMAN JENSCH: It has been my understanding that there were several reprocessing sites within New York, Georgia, the State of Washington — I don't know what the status is with reference to the State of Kansas.

And in order to have something certain for meteorological considerations I presume we would have to, under your theory, consider all of those five locations and then maybe they wouldn't ship it there anyway.

MR. AYRES: Mr. Chairman, I think the Applicant could probably reduce the number of locations which might have to be considered. I might point out also that even within **[2155]** memorandum from the AEC that we were discussing a moment ago the Applicant's environmental report is required to describe the environmental effects from transportation of fuel elements from the fuel fabrication plant to the reactor, as well as the transportation of spent fuel elements from the reactor to the fuel reprocessing plant.

CHAIRMAN JENSCH: Yes.
[2156]

MR. AYRES: Now, if that description is required in the environmental report, even under this memorandum, then presumably the Applicant is going to have to tell us at any rate where that material is going to go.

CHAIRMAN JENSCH: Unless the transportation to any fuel reprocessing plant is the same as it would be to any other reprocessing plant, so that the problems are in common and alike, he may not be able to identify it, or select it — I don't know if they have selected the site or not.

MR. AYRES: Suppose one of the reprocessing sites was in Wyoming, and the other one was in South Carolina or New York. Presumably, the dangers involved are different, if only in quantity, merely by virtue of the greater distance involved.

Now, it may well be that the problems in reprocessing are more similar, even to each other, no matter which plant does the job, than the problems of transportation.

I think what the Commission has done, even in this memorandum, is to say they want the location and they want a description of the problems associated with it. And the same kind of reasoning would apply if you were talking about reprocessing plants, it seems to me.

DR. HALL: Does the Applicant have any knowledge about where the reprocessing plant is going to send this?

MR. AYRES: I have asked that question on **[2157]** interrogatories.

DR. HALL: Did you get an answer?

MR. AYRES: I received an answer, a choice of several, but it seems to me that maybe that question is one which the Applicant ought properly to answer.

DR. HALL: You have asked it, and you have gotten an answer to the interrogatory. Was it not specific?

MR. AYRES: No, it wasn't specific.

DR. HALL: My question is, do you have reason to believe the Applicant knows definitely that one particular site will be the recipient of the fuel processing plant's shipments?

MR. AYRES: No, I don't have reason to believe one way or the other at this point.

DR. HALL: Do you have any notion that in the future the Applicant will always be using the same fuel processor fuel reprocessor?

MR. AYRES: I don't know.

DR. HALL: May they not change from one to another, depending on the best contract terms available to them?

MR. AYRES: In that case, maybe what is involved is a description of the dangers in more than one place. It seems to me at least —

DR. HALL: So we go back to what the Chairman said, we have to look at the whole country, the future plans of all **[2158]** parts of the country. Is that right?

MR. AYRES: I don't know. That depends on what the Applicant tells us about what his plans are. That is at least one answer. The other is this —

DR. HALL: The thing that keeps getting me is I am sure the Applicant — I guess I could ask him — but I doubt

the Applicant has any plans beyond the fuel processing. They want to get rid of the fuel element and buy new ones. But once he sells the fuel elements to the reprocessor, he loses control.

MR. AYRES: That may well be true. But it seems to me the fact that the Applicant himself would like not to be concerned with that question does not mean that it is not a relevant question to be asked before this Board when dealing with the environmental impact of the plant. It may be that the information sought will have to come partly from the Applicant and partly from the Commission.

DR. HALL: I think the Commission doesn't know this, either. They have licensing procedures for processing plants. It seems to me analogous to the fact that I put my garbage can on the street and I pay somebody to come along once a week to haul this material off. And this is basically the thing, that I deal with the vendor and the disposal man has to get a license from my community on where he takes the garbage. If somebody asked me, I wouldn't know where it went.

[2159]

MR. AYRES: I think that is a very accurate description or parallel case. In both cases, it seems to me the same thing applies. That is, if someone was asked, if this Board or some other Board were asked to describe and consider the environmental impact of your garbage or the operation of your household, put it that way, although you might say to them, "I put out my garbage and someone takes it away," that Board, it seems to me, would be required to look at where the garbage went.

DR. HALL: But then you have to get the garbageman in, which, in this case, is the fuel reprocessor.

MR. AYRES: It is also true that the garbageman has to get a license from the Atomic Energy Commission. We

are not dealing with the numbers of factors that we would be dealing with in that situation. Even in planning, I gather there are not a great number of disposal sites.

DR. HALL: But we are considering the license for this reactor from now for 40 years, which is the economic life of the plant, at least I assume that, and it seems to me you are asking us to crystal gaze into the future as to what will be the situation at that time.

MR. AYRES: I think to some extent the National Environmental Policy Act does ask you to do that, although I think it certainly is willing to make some compromise on practicality. It seems to me the Board's duty would be

[2160]

probably to look at as clear a picture as it can get now of what is expected to be done with these wastes.

DR. HALL: In spite of what Justice Wright wrote, it seems impossible to look in the future and if you ask me, we just have to extrapolate.

MR. AYRES: Dr. Hall, we are extrapolating a lot of factors in this proceeding. It seems to me you may be forced to extrapolate and do the best you can.

DR. HALL: Extrapolation of those things which are extrapolatable is proper, but to say where is not. The amount, yes, the total volumes, yes, I think that can be forecast, assuming power growth.

MR. AYRES: Can't we also forecast, though, the general type of reprocessing mechanisms that are expected to be used now, general type of disposal process that is expected to be used now?

DR. HALL: I would not want to.

CHAIRMAN JENSCH: Did you receive a copy of a letter from Dr. Wilson, who has given a limited appearance

statement in the proceeding and who later sent in a letter in reference to this waste disposal matter? I think there was intended to be general distribution by the public proceedings branch of this letter.

DR. HALL: It was included in the transcript.

MR. AYRES: Yes, I have seen it.

[2161]

CHAIRMAN JENSCH: The letter to which I refer is that wherein Dr. Wilson said, well, if there is anybody in the United States that doesn't want a reprocessed waste disposal location, that there were several places in England that I think he said would be interested in, places where they would be interested in having that. I wonder if we assumed that for a moment, that there were not any more places authorized for disposal in the United States, is it your thought we would go to England?

MR. AYRES: I don't know why you would have to go to England.

CHAIRMAN JENSCH: England or Canada.

MR. AYRES: I am not asking we go to Kansas, either.

CHAIRMAN JENSCH: Would you feel happier if you had an assurance that there would be a public hearing at the licensing proceeding for a waste disposal plant?

[2162]

MR. AYRES: No, Mr. Chairman, I wouldn't, and the reason is quite simple. What we are asking is that this plant be examined along with the other reactors that are being built now from the point of view of what it means as a complete system for producing power to the ecology and to possible future generations of human beings.

Now if we were to go to a hearing in Lyons, Kansas, or some other place in Kansas, or wherever it was, on the dis-

posal site, we would be able to examine there on the impact, environmental impact of that site.

But even if at the end of the hearing, the Licensing Board involved said well, this isn't the place to put it, it would not be empowered to say all right, you better shut down Vermont Yankee and all of the other plants, because we haven't got any place to put this waste, and we don't think it is a safe thing to put away.

In short what I said is the only Board that has an ability to judge this system as a whole is the one that is looking at this plant, which will produce the waste and therefore the Board which has the power to decide whether these wastes will be produced.

CHAIRMAN JENSCH: Isn't it something in the technical specifications that there can be only a certain amount of radioactivity stored on the site, which would automatically mean if there weren't some outlet for disposal, you would have **[2163]** to make some adjustments, so that they can't store in excess of a certain amount, they would have to ship it somewhere or stop? It isn't a question of whether a licensing board on reprocessing or waste disposal location would do about that, it would automatically apply to any plant.

But I thought you indicated, and I thought that is where you were going to start your development, that there is probably some limit on practcality. I think that really is the test.

I think the Staff used a little different language, but to the same effect. They said it gets so remote. For instance, let me ask you your view on this: Assuming a burst release of some radioactivity from the plant in the course of normal operations. That burst has measurements made

regarding the level of radioactivity, they trace it out to a certain point, and they get to a point where, with all of the best evidence that is known, there is no exposure, no damage, no injury to any person or being or property or contamination of any foods and so on.

As to that, that is kind of the end line of any possible danger or concern. But there is still some radioactivity, it may be very minute.

Now doesn't that kind of a limit likewise apply here? There is a limit to where your interest goes, where you have to stop and let somebody else pick up the concern. For instance, **[2164]** it seems to me if I read this September 1 item, in the September 3 letter of Harold Price, they are trying to fix a limit of practicality. And they are saying you can have inquiry to the fullest extent about transportation, from the fuel fabricator to the reactor and from the reactor to a processing site of the spent fuel, or rather the package of radioactive waste to a waste disposal area. But they are trying to, within the realm of something that is reasonable, say, well, that is the extent of the control by the Applicant.

It seems to me that the responsibility for any activity depends on control . Once there is a loss of control, there is no fixation of responsibility.

MR. AYRES: I think we —

CHAIRMAN JENSCH: I think you can conceive of minute effects from radioactive bursts, a cloud going off to the moon. Maybe it will go that far, if it has anything in there that has a half life, I don't know how long it takes to get to the moon, but suppose it goes up to the moon.

Are we going to go up to the moon and find out, are we going to trace radioactivity to the moon?

MR. AYRES: I think we are talking about two different kinds of practicality. One of them is what I think the Staff was talking about when it used the notion of proximity. And what I think you were talking about when you described the situation where a burst of radioactivity goes out and we lose **[2165]** track of it, because we can no longer measure it, it becomes so small. At that point in both cases I think you do indeed consider it impractical to follow that effect any further. The reason is because it has become negligible. But that is not the same sort of situation that we are speaking of here. What we are speaking of here is a situation where there is nothing in the slightest bit remote about the likelihood that something is going to occur, namely, that the wastes will be taken to a reprocessing plant or a disposal site. We know all that, it is not remote in that sense.

CHAIRMAN JENSCH: But the control is gone.

MR. AYRES: That is true. The control is gone.

That is true. The control of the Applicant is indeed gone, but the control of the Board in passing judgment on the proprietary of granting an operating license is a different matter all together.

CHAIRMAN JENSCH: It must be related to the control that we can find this Applicant has over an activity that is sought to be licensed to be effective.

MR. AYRES: There is control in the starkest sense, you have it in the sense that you can decide to either license this plant or not to license the plant.

CHAIRMAN JENSCH: Is it your thought that we could issue an order to the Applicant and say now when you send this spent fuel to the waste processing plant at West Valley, New **[2166]** York, that when it comes out of

there, you have to ship it to England? You better tell that West Valley, New York crowd that the Yankee stuff has got to go to England, we are certainly going to ship it back on the, whatever, what was the ship that came over a while ago with tea?

MR. AYRES: No, I don't think that is what I had in mind. What I have in mind is the only decision which is before you at the moment, which is whether or not to grant an operating license to this plant.

What I am asking is for the Board to consider, among the issues that it considers on that question, one issue, which is quite different from asking the Board to decide subissues like shall it require sending things to England.

[2167]

CHAIRMAN JENSCH: Well, the Board has considered this on several occasions, not only from the brief discussions which have been held and the briefs, which I might say we thank the parties for their briefing, I think the briefing on this subject has been very good.

I think it is a subject, that until this letter of September 3, which transmitted the item of September 1, was very clear. The Board is inclined to accept the September 1 transmittal, as sent with the September 3 letter, as representing the Commission action.

Now, even that might be open to some question, since it does not bear the imprints of an official Atomic Energy Commission document. I think the parties are entitled to that kind of an issuance.

MR. ROISMAN: Mr. Chairman, I wonder if I might speak to the subject for a moment?

CHAIRMAN JENSCH: Yes.

MR. ROISMAN: To begin with, the statement attached to the September 3 letter, this statement at its very best,

assuming it was promulgated under a regulation number and so forth, and we didn't have the procedural difficulties that I share with the Board, is as stated in the title, "A Statement of the Scope of the Applicant's Environmental Report with Respect to Transportation Lines and Accidents."

Now, I don't see anything in that document which **[2168]** says that the jurisdiction of this Board is narrowed in terms of the issues that it should cover. In fact it seems fairly logical to me.

The Applicant can't tell us the kind of information that needs to be known about the radioactivity releases at the reprocessing plants or the radioactivity releases at the waste disposal plant. The only thing that tells us what are the issues that this Board can consider is what is in Appendix D as it is written, or if there were a fuller description, which there is not, of exactly what the detailed environmental statement should have, which would be statement of what the Staff should consider in the proceeding.

What is in Appendix D seems to me to completely undercut the suggestions, and I couldn't agree more with the statement that was made by Mr. Ayres, that a quesation involving the disposal of radioactivity is properly here, despite the fact that the Commission does license reprocessing plants, and will at some time and has in some cases already licensed high level waste disposal sites.

In Appendix D, and I have the copy that was not in the Federal Register, but the one that was issued by the Commission in part A, paragraph eight, near the end of the paragraph, there is a discussion of what are the obligations with regard to radiological safety matters, which is what

we are talking about here. It says "While satisfying AEC standards **[2169]** and criteria pertaining to radiological effects will be necessary to meet the licensing requirements of the Atomic Energy Commission act, the cost-benefit analysis will, for the purposes of National Environmental Policies Act, consider the radiological effects together with the thermal effects and the other environmental effects of the facility."

I don't know of any other interpretation that can be placed on that sentence than to be saying that the fact that the wastes from this plant go first to a licensed reprocessing plant, and then a licensed disposal plant does not mean that the Board should not consider at this hearing the impact on the environment.

Now, let me be clear what I mean when I say impact on the environment, or in this case, the radiological effect of the waste disposal, taking the words from the Appendix D.

We know the site where the reprocessing or the fuel disposal is going to be or we don't. Let's take the case where we know where it is going to go. If we know where it is going to go, then we know what the impact on the environment is going to be of the additional waste produced by this plant. We know that this plant is going to add so many curies in the fuel, because we have estimates of how many curies will be in the fuel, to the reprocessing cycle and the reprocessing plant, we know how much that plant is designed to release, under design basis conditions, all parts of its licensing procedure and we **[2170]** can have in this record, in relatively simple form, easy statement of when you add another ten pounds or however these things are computed, of this radioactivity waste, how much release do you get. Now, that effect is not remote. That is not like

your example of sending a little tiny bit of radioactivity to the moon. We are talking about some radioactive materials that have lived for hundreds or thousands of years —

[2171]

CHAIRMAN JENSCH: May I interrupt.? That is just where I wanted to ask if you would expand on that. Is it your thought that we get into the effect of whatever these high level wastes are if they have a half life of a thousand years; are we going to speculate on the environmental impact of the thousand year half life isotope? And what would be the nature of society by that time?

You would think that somebody somewhere would have to draw a line. I don't know what is the most reasonable place out of several possibilities. But if, as Mr. Ayres says, I think his words were we may have to compromise on practicality. Somewhere, even if it seems like an arbitrary line, somewhere something has to be done. And it seems to me that may be done provided there are opportunities for hearing as to the other matters.

Now if you are going to take a half life of a thousand years, we have really got a hearing going here and I don't know whether we aregoing to make it.

MR. ROISMAN: Mr. Chairman, I don't find this at all humorous from the Applicant's side of the table, I find it a rather serious matter. You put your finger on the whole problem. That plant, if it turns on, will produce something that will be with this world long after we are gone. And the issue that the National Environmental Policy Act is directed to is how much do we mortgage the future for our benefit today.

[2172]

Now if we can't predict what is going to happen to that fuel, and those wastes a thousand years from now, then that

is a factor to consider in the wisdom of creating a nuclear power plant. Nuclear power plants create wastes that don't go away very quickly. I am not saying to the Board that we must be able to say that little Jimmy Jones living a thousand years from now is going to have thyroid cancer because of the releases from the waste of this plant. I am saying if there is as much doubt about that question as the Board seems to feel there is, then that is an issue in deciding on the wisdom of licensing this plant. We already have a dirty river out there because nobody thought about that when they put the Barrows Coal Company up, when they put those other plants up up the river. And the National Environmental Policy Act was passed almost two years ago for the specific purpose of saying, stop it, start thinking about what you are going to be doing in the future. And the doubts are part of the environmental analysis.

If we don't have the answer, that is not to say we have to spend 16 months of hearings trying to get it. Let the Applicants say they don't know what it is going to be, they know the radioactivity is high, they know if anybody walked into the room where the waste was, and was exposed to it, unless it was a different kind of human being, they would be killed or seriously affected by the waste and then let's make a [2173] rational judgment about whether or not we want that kind of material around a thousand years from now.

The whole purpose of the Kansas site study was an attempt to predict how reliably you could put wastes in the ground in 1971 and be sure they would still be there, safe and sound, without any contact with human beings at the time that the waste's danger level was gone.

Now we were talking about the question of the remoteness of the imapct. You are talking about an entirely dif-

ferent matter. You are saying there is a lot of doubt. If we had that same doubt about the performance of the emergency core cooling system in this plant, a scant 20 years from now, this Board would be bound to say there is too much doubt about radiological safety, we don't know what will happen if there is a loss-of-coolant accident, it is in the future, we do have to speculate, we don't have enough evidence on it, license denied.

Now until the National Environmental Policy Act was passed, there was at least an issue as to whether or not we had to consider the waste question.

Now the issue is gone. It was gone on January 1 of 1970, and what Judge Wright said on July 23, 1971, was only what Congress said some 15 or 18 months before that.

DR. HALL: I disagree.

May I interrupt your eloquent and passionate speech **[2174]** for the press but—

MR. ROISMAN: Excuse me, Dr. Hall, but that speech had nothing to do with the press. And if it would make you feel beter, I will ask the press to leave. It had to do with this Board's responsibility and I resent the implication of your statement, Dr. Hall.

DR. HALL: All right, I withdraw the implications and I apologize for any inference I made.

I am aware you were speaking to the Board. But let me say I think you are speaking in the wrong forum, that the Board has no jurisdiction in this in my opinion. I am not trying to draw a legal conclusion. I am just saying that the Congress has passed the Atomic Energy Act of 1954, I understand that this is a question that you or some of your colleagues, somebody I read in the press, is challenging, the validity of a portion of the Atomic Energy Act, and of course that is not my concern.

But in all of the problems associated with producing power by nuclear energy have been brought to Congress from time to time and the Joint Committee of Congress has considered these, and is fully aware of the problems. And the notion that the waste is a necessary concurrent or necessary part of the generation of power by nuclear energy is well known to Congress. There has been no move by Congress to pass any law saying that they shall not be used for generation of nuclear energy.

[2175]

To say that NEPA has changed this, the passage of the National Environmental Policy Act has changed this, I think is incorrect.

MR. ROISMAN: But, Dr. Hall, the point is this: We are trying to decide whether this power plant should be licensed.

Now there is going to have to be an analysis of its benefits against its costs. I don't disagree with you that as long as Congress keeps the 1954 Atomic Energy Act as written, that Congress has said as far as we are concerned, there is a point at which the benefits from nuclear power plants would seem to outweigh the disadvantages. But the question is, is Vermont Yankee at that point, or did it fall under the line or over the line? That is why we do a licensing proceeding for an individual plant. We can't get at the wisdom of the Vermont Yankee Plant if we can't at least weigh in the balance all of its reasonably predictable impacts on the environment. Or to be able to put in there that as to some impacts, we know that they will happen, but we can't really say where or when.

All right, that is a factor. You factor that in. Just as you factor in your doubts about the emergency core cooling system in deciding whether or not to approve a plant.

DR. HALL: My problem is then that if you ask, if that were the approach that thisBoard would have to take, I
[2176]
would have to say that I can't foresee all of this so I couldn't license any reactor. And that to me is close to defeating the will of Congress.

It is to the contempt of Congress, but it is certainly defeating the will of Congress.

[2177]

MR. ROISMAN: I think the problem is that you — I can understand why this would happen — but that you are seeing it in the context of the nuclear industry, rather than in the context of this nuclear plant. It may be that what we do here will have an impact on the nuclear industry, but what we are concerned with —

DR. HALL: That doesn't bother me.

MR. ROISMAN: — is this plant. And my concern is, to take the example to perhaps a situation we would never reach in this rather fuzzy cost benefit analysis, if you had weighed all of the benefits of this nuclear power plant, and you weighed all of the costs, environmental, monetary, and so forth, with waste disposal held aside, and you came out just about even, 50/50, maybe 50.1 in favor and 49.9 against, that you would have to factor in this additional cost, the fact that the plant was going to produce a waste product which would require very careful handling in the reprocessing part, and very careful storage in the waste disposal part.

And then if it had a risk to the public health and safety, as it went through those two steps, you might turn the balance the other way. Another plant in which the benefits outweighed the costs by 90 to 1 or something, it might be when you added in the incremental dangers associated with

the processing and storage of fuel, you would still come up with an answer, yes, the plants should be licensed.

[2178]

I am not saying there is a legal requirement, at least not inherent, that the very fact that we don't know what will be happening to the long-lifed isotopes 1,000 years from now, or where they might be, means inherently that the Board can't license the plant. I think it certainly means that the benefits from the plant are going to have to be very high before we pay that price. But that is an issue that the Board can grapple with. It doesn't seem to me to be the kind of overly-expansive issue that you were discussing at all.

I think it is a relatively narrow kind of issue. The Applicant can give a lot of "I don't knows," and the Board can weigh the "I don't knows" in the process of deciding whether to license the plant.

DR. HALL: I don't know how to put the "I don't knows" into the balancing, so I am afraid what would have to result here would be a total investigation of present reprocessing plants, future plans for reprocessing plants, as well as the disposal plants. I think the mechanism, as far as I can understand the guidance, what we are asked to look at, is the mechanism for transportation of spent fuel elements, not to rule or to pass that these will go to a specific location.

And I think the narrowing of this issue to what towns this goes to, what highways, is also foolish inasmuch as we have no knowledge of the road situation [2179] in the future, even what the towns will be then. We can't do it in that narrow and detailed scope. I think the only thing we can do is try to see that there are reasonable procedures, techniques for moving the fuel from this plant to a place where a reprocessing plant might be. I can't see that the

Applicant can be controlling beyond that point. If we have to say that we consider the other, then the scope of this hearing is enlarged, so that I think it just breaks of its own weight.

MR. ROISMAN: But the inability of the Applicant to discuss it, that was exactly my point about the statement that came out in the September 3 letter, I can see a reasonable basis for saying that the Applicant can't do that. But the Regulatory Staff will be the sponsor of the ultimate environmental document that is introduced in this proceeding, namely, the detailed environmental statement.

And what we are talking about is what is the scope of that statement and then what is the scope of this Board's reviewing powers with regard to that statement?

DR. HALL: The Regulatory Staff just is the agency that determines or tries to investigate whether or not the procedures are within the rules and regulations of the Atomic Energy Act and the Code of Federal Regulations. They, I am sure, have no more idea than anybody else about the future status of the reprocessing plant in this country, where they **[2180]** are or will be or who will be operating them or where they are going to send their waste.

MR. ROISMAN: We have in this proceeding already a lot of predictions on things that seem to me to have no greater doubt. The Applicant is going to tell us about the integrity of the fuel rods. We don't know that they will keep buying from that manufacturer. They are going to discuss the questions of the reliability of their inspection system, that have to last through probably people who are not even here today and who are conceivably not even born, if we are talking about 40 years.

Their financial qualifications are based on a prediction of what happens for 40 years. The whole hearing is geared

to a prediction. We all recognize we can predict much more easily what will happen tomorrow than we can what will happen next year and we live with that and make our judgments based upon the fact that some things are more easily known than others.

But if I understand what you are saying, Dr. Hall, you are suggesting that there may be a legal impediment to compliance with what might well be, as I think, the literal range of the National Environmental Policy Act. I would like to direct your attention to Section 103 of the National Environmental Policy Act, which imposed upon the Atomic Energy Commission, as well as all other federal agencies —

[2181]

DR HALL: It was not just the Atomic Energy Commission?

MR. ROISMAN: No, on all federal agencies, an obligation to advise the President on or before, I believe June or July 1, 1971, if there was any impediment in their statutes which would prevent them from full compliance with the Act. The Commission, as early as November last year, advised the President of the United States that there was no such impediment. And it seems to me that it is not open to now come forward as an argument that can validly be adopted by this Board that there is a legal impediment, that because of the way the Atomic Energy Commission Act is written, it would prevent this Board from fully exploring an issue which NEPA clearly requires it to explore.

[2182]

MR. ROISMAN: Mr. Chairman, may I just say one last thing? That is that it seems to me that this is almost the classic kind of question which if the Board feels it wants to decide ought to be referred to the Commission and I say the Commission rather than the Atomic Safety and Licens-

ing Appeal Board, I know one has been established for this proceeding, but we do have the problem of whether or not what Mr. Price sent out represented the position of the Commission. It is signed in his capacity as Director of Regulation.

We are trying to interpret a document, when we think of Appendix D, that was just written by the Commission. It seems to me that sending it to another group of men who themselves would have to speculate on what the Commission might have meant, could only lead us down the road where there would be a lot of doubt.

I would urge the Board to, if it wishes to consider the question of certification, to certify it to the Commission itself.

DR. HALL: In a sense, Mr. Roisman, you are making a challenge to the regulations, are you not?

MR. AYRES: Let me answer that, because I think it properly comes from me anyway. I think the answer to that is no. Quite the opposite. We are asking that the regulations be interpreted so as to preclude that. It is perfectly possible for the Board to make a decision without making any sort of **[2183]** challenge to the regulations on this.

CHAIRMAN JENSCH: Does anybody else desire to speak to this matter?

MR. MC GREGOR: Yes, Mr. Chairman.

The interest of the Commonwealth in this particular matter centers around the transportation of fuel to nuclear plants and the waste from nuclear plants through the Commonwealth of Massachusetts. The Commonwealth has regulations which require notice of such transportation and for that reason the Commonwealth is interested in the issue that has been raised by Mr. Ayres' motion.

We would also like ot offer, for what the Board may wish to do with it, our advice as lawyers regarding the issue of what NEPA and what the regulations require.

CHAIRMAN JENSCH: We would be happy to have your statement.

MR. MC GREGOR: A fuller statement of our advice appears in a letter that we wrote in response to your telegram which invited our comments on this very issue. I would like to point out though in light of the discussion that we have had today that the issue is not a question of holding Vermont Yankee responsible in terms of physical control of what the plant puts out, but rather something I don't think any of us would quarrel with, that Vermont Yankee is responsible for the effects of its operation.

[2184]

On the issue of control, I would like to point out just as Mr. Roisman and Mr. Ayres pointed out, that we are going to be considering predictions on various other matters; that the Commonwealth is going to be very interested in looking at where the liquid effluent from the plant goes when it does go into the Connecticut River and what its effects will be, wherever they may occur even though there is that loss of physical control, once the effluent is placed into the river.

I think the analogy is a good one, and even though there may be more difficult decisions to be made as to nuclear waste, the analogy holds, and the Board is the one to make that decision.

The other licensing proceedings that have been mentioned are ones which consider how to handle nuclear waste once it is generated and they have not considered and will not consider whether the waste should be generated in the first instance. And I think this Board is appropriate to fit into

its calculus the incremental harm that will come from the nuclear waste from this plant.

I don't think the decision is as difficult as many would have it seem, because ultimately NEPA and the Commission's regulations do not require the impossible. We are men sitting here, you are men sitting on the Board and can only do your best to predict what effects there will be from nuclear waste. And **[2185]** what will fit into the calculus will be whatever however detailed your prediction may be, or if you cannot make a prediction, the fact that you have a level of doubt will the factor that is fit into the calculus of your decision.

I think it is important that someone in our governmental structure begins to make these ultimate decisions and because we find it burdensome or at times of difficult practicality to use our present sometimes cumbersome procedures in making these decisions is no reason for us not to try.

DR. HALL: I just wanted to respond briefly, partly to continue the discussion with Mr. Roisman.

It seems to me that the wastes thatcome from the reprocessing of the fuel taken from this reactor can be demonstrated to present a relatively minor problem. I won't, I am not testifying in this case of course, but let me just make that statement as an assumption and harken back to the time when there were very few reactors in this country, such as the time of Shippingport and Dresden 1, in which the reprocessing was not a problem. The problem that I agree with all of you is when we have a large number of reactors and we have many, many kilowatts. But still relating to this licensing here, the problem of this reactor is not the thing that is going to cause the problem for this country, it is the aggregate that is going to cause a problem

for this country. And how that fits into this licensing proceeding, I don't see.

[2186]

MR. AYRES: Well, one sort of answer to that I think is that we have no forum in which to discuss the problem in the aggregate.

DR. HALL: I agree with you.

MR. AYRES: And therefore the only way we can consider it is at this proceeding and similar proceedings, at least in our mind.

Secondly, I think what we are really asking is that the Applicant and the Staff, if necessary, tell us how large the danger is from a given plant, this one. To say that the problem is one of the aggregate of a number of plants, perhaps a thousand or 1,500 plants in the next forty years, whatever the projections are, only tells us that the danger from the aggregate is about a thousand or 1,500 times as high as it is from a given plant, assuming they are the same size.

DR. HALL: It may be more than that.

MR. AYRES: Certainly. But what I am saying is there is some expressable relationship between the two. You can talk about the waste from this plant, the dangers involved in this, and rather than assume an answer, it seems to me the thing to do is ask them what those dangers are.

[2187]

CHAIRMAN JENSCH: Does anybody else desire to speak to this matter? The Board hears no such suggestion. The Board shares many of the concerns that have been expressed by the parties here. It is not a clear line. The Board, as I indicated, is inclined to accept this September 1 statement as reflecting Commission action at that time.

Whether Appendix D, which was issued on September 9, modifies that, is not clear, except insofar as the language used is considered, including all environmental impact.

The Board believes this matter should have Commission determination, that Atomic Safety and Licensing Board needs further guidance from the Commission. This is a major policy determination. It affects not only this plant, but it affects the licensing process. It is the view of the Board that this Board should not attempt to prescribe the policy matter, the Commission must do it. The procedure for this, however, is not quite so certain. There are two general methods. One is by certification and the other is by appeal.

In order to, in a sense, move this along, with the burden on the parties to carry the initiative, the Board is inclined to make a ruling and refer the ruling under the procedures for appeal. The Board will permit an interloculatory appeal in this regard, in order that the parties can then determine the precise issue that they present **[2188]** and so that the Board can secure a forum for the determination.

The referral procedure was utilized in the Duke Power Company construction permit proceeding and a determination was made following that referral. The Board believes that insofar as there is any specificity and guidance, it comes from this September 1 document which is not too clear to us; it is not a document that I think is in a form that it is certain that it represents Commission action.

I think the Commission action, an official document as the Commission has done, should be signed by the Atomic Energy Commission and it is stated to be by action of the Commission and it bears the attestation of the Secretary of the Atomic Energy Commission, as an official action of

the Atomic Energy Commission. This document does not have that imprint. But we will accept it for the purposes of our ruling, but indicate our doubt about it by allowing the interlocutory appeal and referral to the Commission as the regulations provide.

The Board, therefore, denies the motion of the National Resources Defense Council and the associated parties in reference to it, to consider the aspects of transportation of high-level radioactive wastes from the fuel reprocessing plant, and the storage of the low level wastes at whatever location. The parties will better be able to activate the **[2189]**
procedures for appeal and consideration, we believe, and, therefore, the Board will allow the interlocutory appeal.

MR. WALLIG: Mr. Chairman, one matter of procedure. Since the Commission established an Appeal Board for this proceeding, Section 2.785(D) of the Commission's Rules provide that in those proceedings where the Appeal Board has been set, that the actions formerly performed by the Commission under Section 2.730, which is the section in which referral of a ruling of the Board is set forth, will be exercised by the Appeal Board.

Accordingly, I believe the proper procedure will be to the Appeal Board. The Appeal Board also has a right to certify a question on its own to the Commission, but under the rules, which we are bound by, there is no direct right to have an appeal or certification or referral to the Commission when there is an Appeal Board.

CHAIRMAN JENSCH: Yes, I think the problem is as to what is normally considered by the Commission. I think that may open up the realm of possible Commission action on the appeal, because this involves a new regulation, Appendix D, issued September 9, 1971, under a new statute

which Congress enacted, the Environmental Policy Act, and it has been the impression of the Board that the Atomic Energy Commission, certainly at the outset, will make all decisions in reference to the scope of activity to be conducted in its name [2190] respecting national environmental policy matters.

And this does involve an interpretation of the scope of the regulations that the Commission has issued. And while it may not be a challenge to the Commission, it certainly is an appeal to the Commission on its own regulation and, of course, the Atomic Safety and Licensing Board did not issue the regulation.

MR. AYRES: Mr. Chairman, one clarifying point. Your description of the issues a few moments ago was somewhat different from the description of the issues in our motion. I assume that you meant to cover all of the issues that we raised essentially in your statement.

CHAIRMAN JENSCH: Yes. That is why the Atomic Safety and Licensing Board here feels that the precise statement of the issue can better be presented by the parties, so that the matter will truly be before the Reviewing Board, whether it is the Atomic Energy Commission or the Atomic Safety and Licensing Appeal Board.

The mark of delineation between those two is not clear to us for this type of transaction.

MR. AYRES: I wonder also if you will be giving us a written opinion or order?

CHAIRMAN JENSCH: No. You may accept the statement in the transcript and use it as a basis for your action.

MR. ROISMAN: Mr. Chairman, another point —

[2191]

CHAIRMAN JENSCH: We can, however, and I think we did in the Duke Power case issue a formal order. But I think it may be more delaying than helpful. The referral of the ruling is in accordance with the rules of the Commission, as Staff Counsel identified.

MR. ROISMAN: Mr. Chairman, just so we will know for filing purposes, will the Board be referring to the Commission, so there will not be a necessity to refile, the various motions and responses that have dealt with this question? I don't know; there is nothing in the regulation —

CHAIRMAN JENSCH: I think that is a matter you folks will have to decide, because I think the procedures, once the referral is made, it will have to be determined by the parties. If they feel a better presentation can be by incorporating all of these things, maybe they would be inclined to do that. I think they should adopt whatever will best present their position.

Let me check just a moment, please.

DR. HALL: You might need a petition for an oral hearing. We don't know. Rule 2.730, Subsection F, permits an announcement on the record during a hearing of the ruling without securing a separate order. We feel that this is adequate to fully refer that to the Commission.

At this time, let us recess, to reconvene in this room at 3:45.

(Recess.)

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF	DOCKET
VERMONT YANKEE NUCLEAR POWER CORPORATION	No. 50-271
(VERMONT YANKEE NUCLEAR POWER STATION)	

ORDER OF REFERRAL OF RULINGS

The Atomic Safety and Licensing Board, in accordance with Section 2.730(f) of the Commission's Rules of Practice, refers to the Atomic Safety and Licensing Appeal Board for further consideration and determination the rulings made by the Licensing Board, as reflected at pages 2187-8 of the transcript, respecting the processing and subsequent transportation and storage of high level wastes from and after the operation of a nuclear fuel waste processing plant. The rulings of the Board sustained objections to interrogation that sought to render relevant in this operating license proceeding the inquiries concerning levels of radioactivity and protections therefrom in operations of some other company's processing plant and the transportation therefrom of high level wastes to some undefined storage area. The rulings are referred for determination in view of the scope of Appendix D to 10 Code of Federal Regulations, published on September 9, 1971, which provided for considerations of effects of construction or operation of any proposed licensed activity which would have a significant impact on the environment.

The Atomic Safety and Licensing Board also refers to the Atomic Safety and Licensing Appeal Board the Motion

of Intervenor Natural Resources Defense Council, Inc. (NRDC) requesting, in accordance with Section 2.730(g) of the Commission's Rules of Practice, certification of the above identified referral to the Atomic Energy Commission upon the ground that a broad policy question is involved which, it is asserted, should receive the Commission's determination.

Copies of all of the attached papers have been served by the movant upon all parties, and that service need not be duplicated. Copies of this Order of Referral have been served by the Board upon all parties.

ATOMIC SAFETY AND
LICENSING BOARD

By SAMUEL W. JENSCH, *Chairman*

Attachments:
12/51/71 Ltr NRDC to Chairman Schlesinger
12/20/71 Motion Requesting Referral to AEC
12/20/71 Referral Brief of NRDC
w/Exhibits A through E

Issued:
December 29, 1971
Germantown, Maryland

[EXCERPTS FROM FINAL ENVIRONMENTAL STATEMENT FOR VERMONT YANKEE NUCLEAR POWER CORPORATION, USAEC DIRECTORATE OF LICENSING (July 7, 1972)]

Section III D.2

2. *Radioactive Waste*

In the operation of nuclear power reactors, radioactive material is produced by fission and by neutron activation reactions of metals and material in the reactor system. Small amounts of gaseous and liquid radioactive wastes enter the effluent streams, which are monitored and processed within the Station to minimize the radioactive nuclides that will ultimately be released to the atmosphere and into the Connecticut River at low concentrations under controlled conditions. The radioactivity that may be released during operation of the Station at full power will be in accordance with the Commission's regulations, as set forth in 10 CFR 20 and 10 CFR 50. In addition, modifications will be made to the Station's radwaste system to reduce these levels to the lowest level practicable, and the applicant has stated that he intends to use the present waste treatment system to its full capability.

The waste treatment systems described in the following paragraphs are designed to collect and process the gaseous, liquid and solid waste which might contain radioactive materials.

The waste handling and treatment systems currently installed at the Station are discussed in detail in the Final Safety Analysis Report and in the applicant's Environmental Report, Vermont Yankee Nuclear Power Station, and Supplement to the Environmental Report dated December 21, 1971.

a. *Liquid Radioactive Waste*

In a boiling water reactor, the circulating primary coolant water receives radioactive isotopes from two sources: (1) fission products escape into this water through defects in the cladding of the fuel rods as the water passes through the reactor core, and (2) corrosion products and erosion products from the reactor coolant circulation system are carried along in this water and made radioactive by neutron (and proton) bombardment in the reactor. To keep the activity level of the reactor primary coolant water low, a fraction of the circulating stream is continually withdrawn, passed through a filter-demineralizer system (the "reactor water cleanup system") to remove suspended and dissolved radioactive (and nonradioactive) materials, and returned to the primary coolant stream. The radioactivities of many of the radionuclides present in the primary coolant were calculated for the condition when equilibrium has been reached between escape of these nuclides from failed fuel elements and their removal by decay, purification of the coolant, and leakage. These activities were calculated with the assumption that 0.25% of the total thermal power is produced in leaking fuel elements and that the reactor water cleanup system had a removal efficiency of 90% for all fission products except molybdenum and yttrium.

Molybdenum and yttrium are not generally removed by demineralizers. However, if no removal is assumed, the calculated activity in the reactor coolant is significantly greater than activity measured in operating boiling water reactors. By ratioing the total activities of the coolants, on the basis of such measurements, the activity level of tellurium is also overpredicted by the calculations. Empirical removal efficiencies were, therefore, used for these isotopes to obtain the primary coolant activities considered in the effluent calculations.

The origins and processing of liquid radioactive wastes in the Vermont Yankee Nuclear Station are shown in Fig. III-15. These wastes will be segregated for treatment into two main streams — the equipment drains stream and the floor drains stream. The equipment drains stream will consist of about 15,000 gpd of "high purity" water which is low in dissolved and suspended solids content. The floor drains stream will consist of about 8,000 gpd of "low purity" effluent which is somewhat lower in radioactivity but higher in dissolved and suspended solids. The processing systems will be operated batchwise with wastes accumulated in tanks and processed as necessary.

The equipment drain stream will be purified by filtration and demineralization, and then returned to the reactor makeup water. The origins of the waste streams entering the system are leakage from the pumps and valves involved in circulating condensate, feedwater, and waste liquids and from the control rod, scram, shutdown, and recirculation systems; drainage and overflows from the above systems; heat exchangers; steam lines; fuel pool system; and reactor water cleanup system.

When enough effluent has collected in the waste collector tank the effluent is passed through a precoat filter and a mixed bed demineralizer. The filter removes sludge and suspended corrosion products. The efficiency of the demineralizer in absorbing metallic and nonmetallic ions from the solution depends on a number of factors, such as the identity of the ion, the acidity of the solution, and the amount of material already absorbed in the resin.

After passage through the filter-demineralizer system, the effluent is pumped to the waste sample tanks, where its radioactivity is measured. If the radioactivity level is low

enough (e.g., $< 3 \times 10^{-3}$ $\mu Ci/cm^3$), the effluent is pumped to the 500,000-gal condensate storage tank to be used as makeup primary coolant water. However, if the activity of the effluent is too high for use as makeup water, the effluent is not sent to the condensate storage tank but is returned to the waste collector tank.

The daily volume of wastes entering these streams (15,000 gal) is made up of 6,000 gal from the drywell equipment drain sump (at the activity of the primary coolant); 2000 gal from the reactor equipment drain sump, 1000 gal from the radioactive building equipment drain sump, 3000 gal from the turbine building drain sump, and 3000 gal of miscellaneous drains (all at an activity of 1% of that of the primary coolant, representing small leakages that are diluted with other process liquids). An overall decontamination factor of about 100 must be realized in the filter-demineralizer to reduce the activity below the required 3×10^{-3} $\mu Ci/cm^3$. The anticipated releases shown in Table III-1 are based on achieving this decontamination factor and on recycling 90% of the influent to the condensate storage tank. Operating experience at other similar reactor stations has shown that this is attainable.

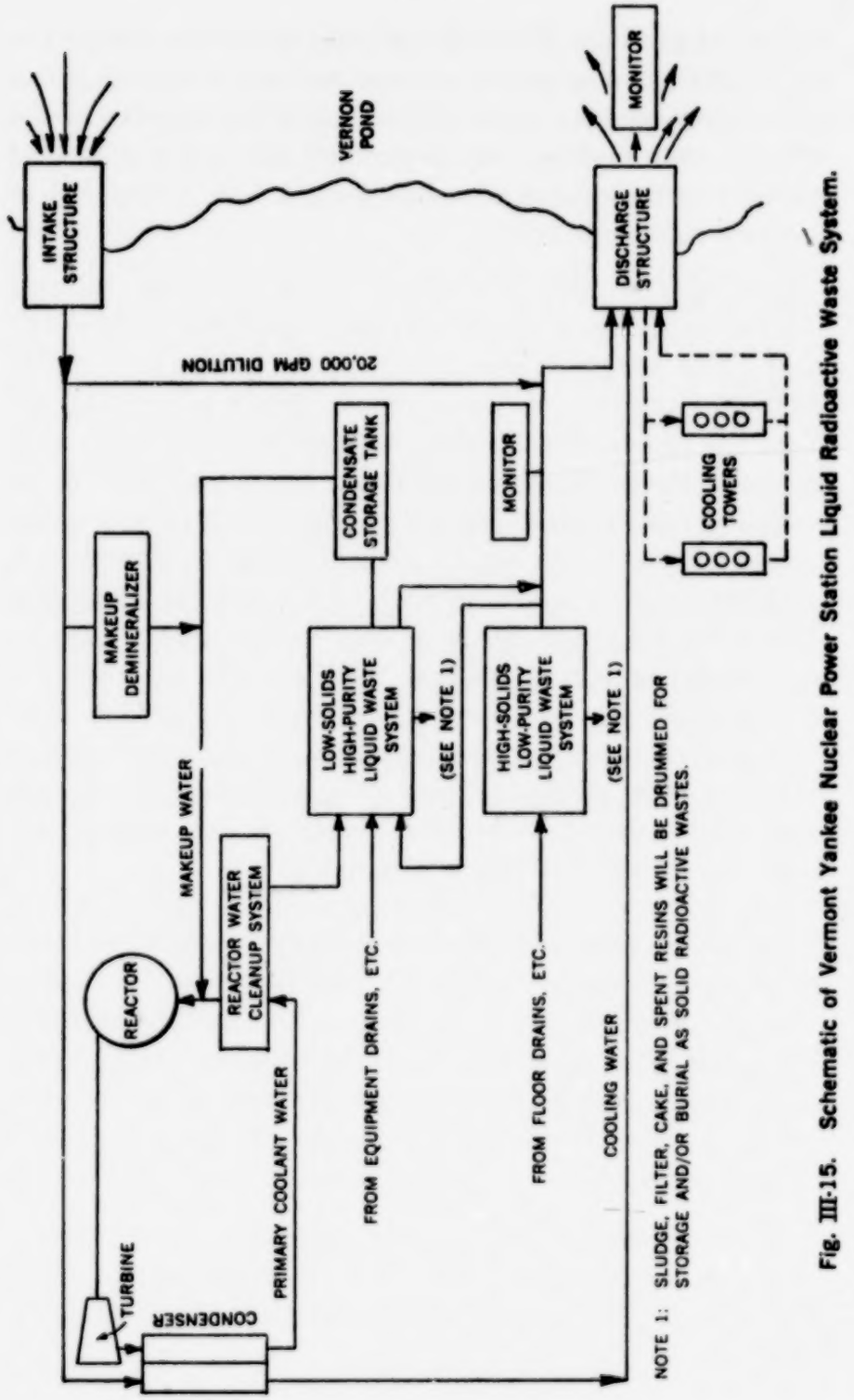

Fig. III-15. Schematic of Vermont Yankee Nuclear Power Station Liquid Radioactive Waste System.

The floor drain system collects liquid wastes from floor drain sumps which are estimated to be 2000 gpd from the reactor building floor drain sump, 1000 gpd from the radioactive waste building floor drain sump, 2000 gpd from the turbine building floor drain sump (all at a radioactivity of 1% of the primary coolant), and 3000 gpd from the drywell floor drain sump (at the activity of the primary coolant). These liquids are processed through a filter to the floor drain sample tank, sampled, and released if the activity is low in comparison to applicable regulations. If the radioactivity content of the sample tank is such that a discharge limit would be approached, the waste can be held in the tank for a period of time to allow radioactivity reduction through decay. If this delayed release is not practical because of the volumes of waste being generated, or because the radionuclides are long lived, then the liquid in the sample tank will be pumped through the equipment drain system filter and demineralizer to the waste sample tank for analysis. This waste may not be of sufficient chemical purity to allow reuse within the reactor system. In this case, the waste sample tank contents would be diluted and discharged. The anticipated releases shown in Table III-1 are based on processing all liquid wastes from the floor drains through the equipment drain system (with a decontamination factor of 100) and releasing them.

Chemical wastes collect in the chemical waste tank. Subsequent treatment is dependent upon the results of analysis to determine chemical purity of the liquid. When this shows that the waste can be chemically neutralized sufficiently to allow treatment as a low purity waste, the contents of the chemical waste tank will be directed, after neutralization, to the floor drain collector tank for treatment as low purity wastes as described above. If the chemical nature or radioactivity content precludes treatment as low purity

waste, this liquid may be pumped into drums, mixed with water-adsorbent material to remove free water and handled as a solid waste. Detergent wastes are collected in the decontamination solution tank where they are sampled for radioactivity content. These wastes will then be filtered, diluted, and discharged. Table III-1 includes the calculated releases from these sources.

b. *Gaseous Wastes*

During power operation of the Station, radioactive materials released to the atmosphere in gaseous effluents include fission product noble gases (krypton and xenon); activated argon and nitrogen; halogens (mostly iodines); tritium contained in water vapor; and particulate material including both fission products and activated corrosion products. Fission products will be released to the coolant and carried to the turbine by the steam if defects occur in the fuel clad or if uranium is present as an impurity in, or on, the clad itself.

TABLE III-1

Annual Release of Radioactive Material in Liquid Effluent from Vermont Yankee Nuclear Power Station (100% Power)

Nuclide	Ci/year	Nuclide	Ci/year
^{89}Sr	0.45	^{132}I	0.042
^{90}Sr	0.029	^{133}I	0.14
^{91}Sr	0.00044	^{135}I	0.00013
^{90}Y	0.10	^{134}Cs	0.25
^{91m}Y	0.028	^{136}Cs	0.073
^{91}Y	0.22	^{137}Cs	0.19
^{93}Y	0.0044	^{137m}Ba	0.036
^{95}Zr	0.0047	^{140}Ba	0.65
^{97}Zr	0.000079	^{140}La	0.5
^{95}Nb	0.0048	^{141}Ce	0.0050
^{97m}Nb	0.000076	^{143}Ce	0.00055
^{97}Nb	0.0000079	^{144}Ce	0.0032
^{99}Mo	0.095	^{143}Pr	0.0040
^{99m}Tc	0.091	^{144}Pr	0.0032
^{103}Ru	0.0034	^{147}Nd	0.0016
^{106}Ru	0.0011	^{51}Cr	0.040
^{103m}Rh	0.0034	^{54}Mn	0.0035
^{105}Rh	0.00033	^{55}Fe	0.18
^{106}Rh	0.0011	^{59}Fe	0.0066
^{127m}Te	0.00097	^{58}Co	0.42
^{127}Te	0.0010	^{60}Co	0.044
^{129m}Te	0.0091	^{65}Zn	0.000088
^{129}Te	0.0058	^{69m}Zn	0.000021
^{131m}Te	0.0010	^{187}W	0.016
^{131}Te	0.00019	^{24}Na	0.0021
^{132}Te	0.040	^{32}P	0.0015
^{130}I	0.000096	Total	$\sim$5
^{131}I	1.2	^{3}H	$\sim$20

The major source of gaseous waste activity during normal Station operation will be the off-gas from the steam condenser air ejectors. Other sources include primary containment purge, the gland seal off-gas system and the reactor building, raidoactive waste building, and the turbine building exhaust systems. Figure III-16 is a schematic of these systems.

Prior to release, the off-gases from the main condenser air ejectors will be delayed for a minimum of 30 min in a holdup pipe (to allow decay of activity of short-lived radioactive noble gases) and filtered through high efficiency particulate filters and charcoal adsorbers. Release will be through the main station 318-ft-high stack.

The reactor building exhaust system removes air from the reactor building ventilation system and from the drywell and torus purge exhaust system. This air, which normally contains low concentrations of activity, is discharged to the main station stack. The system is so arranged that the exhaust air can be directed to the standby gas treatment system (high efficiency particulate filters and charcoal adsorbers in series) for release through the main station stack if the activity level is high. The primary containment (drywell) is normally a sealed volume. However, during periods of refueling, maintenance, or whenever primary containment access is required, the potential exists for the release of airborne radioactivity to the environment. In such cases, air is removed through the drywell and torus purge system (prefilters and high efficiency particulate filters) and discharged to the reactor building vent stack.

The turbine building exhaust system which is expected to contain low concentrations of activity, primarily from steam system leakage, draws air from the turbine building and is discharged to the atmosphere through the main station stack which is continuously monitored.

The steam/air exhaust from the turbine sealing system passes through a gland seal condenser where the steam is condensed and the non-condensables are exhausted to the gland seal holdup line. The small quantity of radioactive gases released by way of the gland seal off-gas system is delayed for about 2 min to allow decay of the major activation gases (^{16}N and ^{19}O) prior to release through the main station stack. All sources of gaseous wastes are continuously monitored to assure that effluent releases are within applicable standards.

On the basis of operating experience with reactors of similar design, it is expected that the off-gas system described above will keep releases of gaseous radioactive wastes well within the limit specified in 10 CFR 20. In order to reduce these levels to the lowest level practicable during extended power operation, the applicant plans to install additional gaseous holdup equipment. A modification to the present system will provide recombination of the hydrogen and oxygen formed in the reactor coolant, a condenser to remove much of the water vapor, and a charcoal delay system to provide additional retention time for krypton and xenon and to provide additional adsorption of iodines and particulates. The modified system is expected to be operational by the time of the first refueling. The staff anticipates that the proposed modification will result in a reduction of off-gas activity (curies of noble gases) released by a factor of at least 20 relative to a 30-min holdup system and that ^{131}I from all gaseous sources will be reduced to less than 0.6 Ci/year.

On the basis of experience at other operating plants, gaseous activity releases for Vermont Yankee are estimated at 3,000,000 Ci/year, prior to the installation of the modified treatment system. However, based on commitments made in the Technical Specifications to the operating license, the

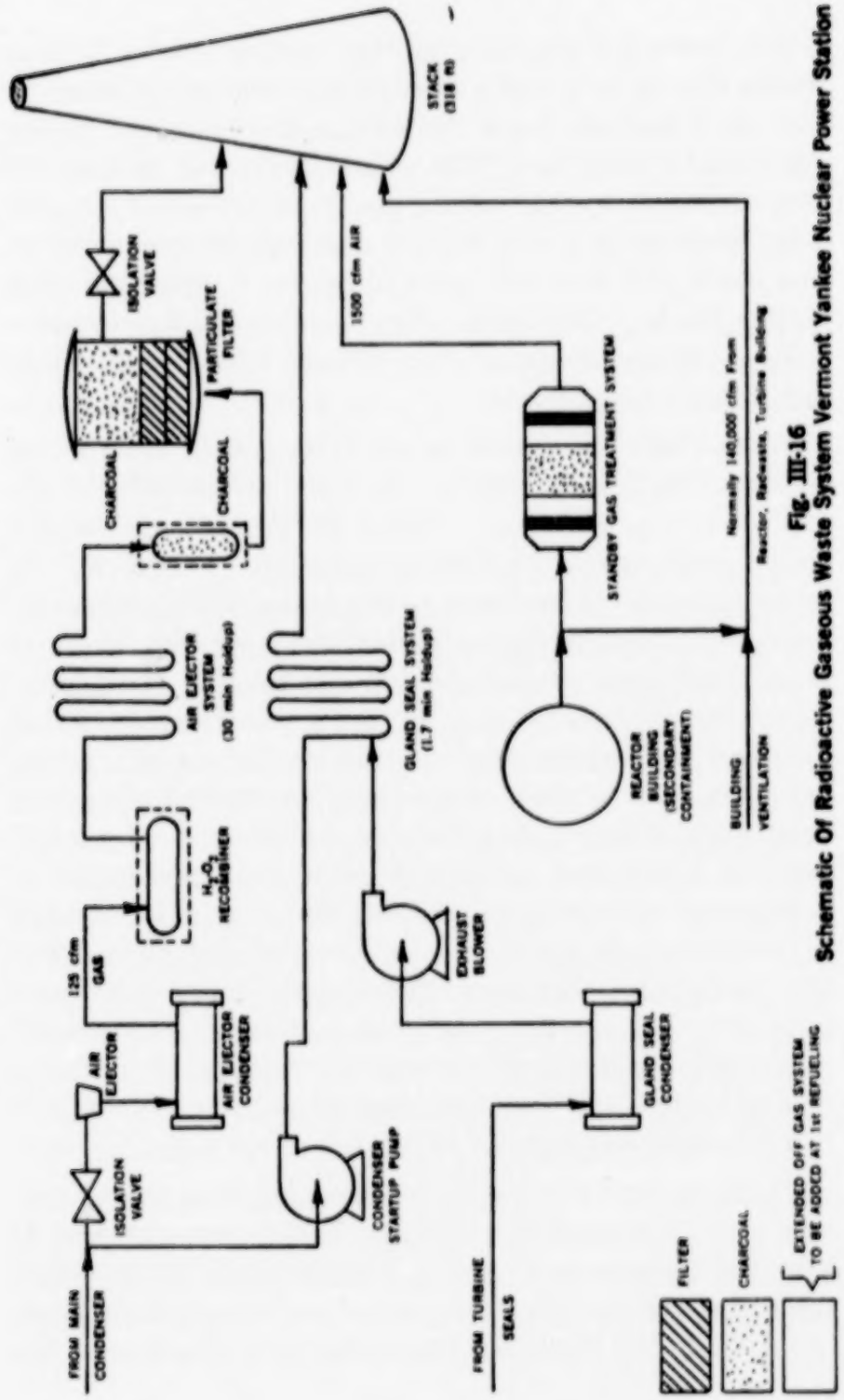

Fig. III-16
Schematic Of Radioactive Gaseous Waste System Vermont Yankee Nuclear Power Station

actual effluents will be administratively controlled to an annual average rate of 22,000 μCi/sec or about 700,000 Ci/yr. The expected distribution is shown in Table III-2.

c. *Solid Radwaste*

Since both the condensate and reactor water cleanup systems use pre-coat Powdex type ion exchange resins, which are not regenerated, most of the radioactivity from corrosion and fission products is collected and retained on these resins. In addition, activity removed from the high purity wastes by the liquid radwaste system demineralizer is also retained. Therefore, the bulk of the solid radioactivity wastes consists of spent ion exchanger resins. The remaining solid wastes consist of filter sludges, air filters, and miscellaneous paper and rags.

Ion exchange resins are dewatered in phase separators and placed in shielded casks. Dry wastes are compacted in drums. No solid wastes will be stored permanently at the Station. All solid radioactive wastes will be packaged and shipped offsite for disposal at an AEC licensed disposal site in accordance with AEC and Department of Transportation (DOT) regulations.

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SECTION III.E

TRANSPORTATION OF NUCLEAR FUEL AND SOLID RADIOACTIVE WASTES

The nuclear fuel for the Vermont Yankee reactor is slightly enriched uranium in the form of sintered uranium oxide pellets encapsulated in zircaloy fuel rods. Each fuel element is made up of 49 fuel rods, is about 14-½ ft long, and weighs about 680 lb. In each year of normal operation, about 88 fuel elements will be replaced.

The applicant has indicated that unirradiated fuel for the reactor will be transported by truck from Wilmington, North Carolina, to the plant site, a shipping distance of about 700 miles. The applicant has not stated where the irradiated fuel or solid wastes will be shipped, but he did indicate irradiated fuel will be transported by truck or rail and solid wastes by truck. Distances of 900 miles for shipping the irradiated fuel and of 500 miles for shipping the solid radioactive wastes have been assumed.

1. *Unirradiated Fuel*

The applicant has indicated that unirradiated (cold) fuel will be shipped in AEC-DOT approved containers which hold two fuel elements per container. About three truckloads of 16 containers each will be required each year.

2. *Irradiated Fuel*

Fuel elements removed from the reactor will be unchanged in appearance and will contain some of the original ^{235}U (which is recoverable). As a result of the irradiation and fissioning of the uranium, the fuel element will contain large amounts of fission products and some plutonium. As the radioactivity decays, it produces radiation and "decay heat." The amount of radioactivity remaining in the fuel varies according to the length of time after discharge from the reactor. The fuel elements are placed under water in a storage pool for cooling and radioactive decay prior to being loaded into a cask for transport.

Although the specific cask design has not been identified, the applicant states that the irradiated fuel elements will be shipped after a minimum 90-day cooling period in approved casks designed for transport by either truck or rail. The cask will weigh perhaps 30 tons for truck or 100 tons for rail. Transport of the irradiated fuel will require an estimated 15 truckload shipments per year with six fuel elements per cask and one cask per truckload or five rail carload shipments per year with 20 fuel elements per cask and one cask per carload. An equal number of shipments will be required to return the empty casks.

3. *Solid Radioactive Wastes*

The applicant estimates that the solid radioactive wastes generated by the reactor will amount to from 1500 to 1800 ft^3/year of resins, 65 ft^3 of which may contain up to 15 curies per cubic foot (Ci/ft^3) and the rest, approximately 0.3 Ci/ft^3. In addition, about fifty 55-gal drums of miscellaneous wastes will be generated each year. The resins will be shipped in shielded casks weighing up to 45,000 lb when loaded. The applicant estimates that 8 to 12 truckloads of casks and drums of wastes each year will be shipped for disposal — probably to West Valley, New York — a shipping distance of about 500 miles.

. . . .

SECTION IX

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction and future operation of the Vermont Yankee Nuclear Power Station will use a certain amount of air, water, and land. The plant site and the nature and use of Vernon Pond will be affected. It is likely that the plant site will be used for power production for a long period. The staff believes that industry and population will increase in the region, which will lead to increased commitments of resources and perhaps irreversible changes in natural areas around Vernon.

Long-lived radioactive materials will be produced by fission of nuclear fuel in the core of the reactor and neutron activation of reactor parts near the core. The eventual disposal and storage of radioactive materials will require a certain amount of space, probably in an area remote from this plant, for a very long period of time, and could for all practical purposes be considered as an irreversible commitment of resources.

Other possible irreversible changes include the long-range effects on fish population, discussed in Sect. V.C.4, and transmission line requirements, in Sect. III.B.

Some of the ^{235}U, ^{238}U, and ^{239}Pu in the core of the reactor will be consumed and must be considered an irretrievable use of resources. Additional chemicals and fuels will be consumed for operation of associated plant equipment, such as emergency diesel generators and cooling towers. These commitments are small compared with the need for production of essential electrical energy for this area.

Of the $\sim$60 acres of land used for plant buildings, it would appear that only a small portion of this land (less

than 5 acres) beneath the reactor, control room, radwaste and the turbine-generator buildings and the cooling tower structures, would be irreversibly committed. Also, some components of the facility such as large underground concrete foundations and certain equipment are, in essence, irretrievable due to practical aspects of reclamation and/or radioactive decontamination. The degree of dismantlement of the plant, as previously noted, will be determined by the intended future use of the site, which will involve a balance of health and safety considerations, salvage values, and environmental effects.

ENVIRONMENTAL SURVEY OF THE NUCLEAR FUEL CYCLE

PREPARED BY

U. S. ATOMIC ENERGY COMMISSION

DIRECTORATE OF LICENSING, FUELS AND MATERIALS

November , 1972

SUMMARY

1. *Background and Purpose*

As part of the Federal licensing actions for individual nuclear power plants, detailed environmental statements are issued as public documents in conformance with the National Environmental Policy Act (NEPA) of 1969. These statements assess in detail the environmental impact associated with the construction and operation of the specific nuclear power plant, as well as the transportation of radioactive materials to and from the plant. This document is an environmental survey of the nuclear fuel cycle which supports the individual nuclear power plants.

Detailed environmental reviews are carried out in the separate licensing actions for each individual fuel cycle facility involved in the handling of source material, or special nuclear material, and for production facilities. Most of the facilities discussed in this environmental survey were constructed and licensed by the AEC prior to the enactment of NEPA. Accordingly detailed assessments of environmental impact have not been carried out on facilities that predated the NEPA act. It is expected, however, that detailed environmental reviews on the fuel cycle facilities processing the bulk of the nation's fuel material will be accomplished within the next few years as a result of planned modifications and expansions of existing plants, and construction of new ones. This environmental survey is not intended in any way to replace or preclude these thorough and meticulous analyses of individual plants.

2. *Scope*

This survey assesses the environmental considerations related to the currently predominant nuclear fuel cycle for uranium dioxide (UO_2) fueled, light-water moderated and

cooled nuclear power plants (LWR). In the United States, about 99% of the electric power generated from nuclear fuel incorporates this fuel cycle and a large percentage of the plants that are under consideration for construction permits or operating licenses will utilize this fuel cycle. In addition, estimates of the nuclear generation of electric power indicate that this predominance of LWR use will prevail through most of the present decade. Alternative nuclear fuel cycles involving plutonium recycle in the present generation of LWR power reactors and the fuel cycles for gas-cooled and fast breeder reactors will be considered in future documents.

The specific components comprising the LWR supporting fuel cycle are shown in Figure S-1 and include the following:

(a) Mining uranium ore.

(b) Milling and refining ore to produce uranium concentrates (U_3O_8).

(c) Production of uranium hexafluoride (UF_6) from uranium concentrates to provide feed for isotopic enrichment.

(d) Isotopic enrichment of uranium hexafluoride to attain reactor enrichment requirements using the gaseous diffusion process.

(e) Fabrication of nuclear reactor fuel including: converting UF_6 to uranium dioxide (UO_2), pelletizing, encapsulating in rods and assembling fuel elements.

(f) Reprocessing irradiated fuel and converting uranium to UF_6 for recycle through the gaseous diffusion plant for re-enrichment.

(g) Radioactive waste management of high level and other than high level waste, including long-term storage of wastes.

(h) Transportation activities associated with moving materials to and from each of the above operations.

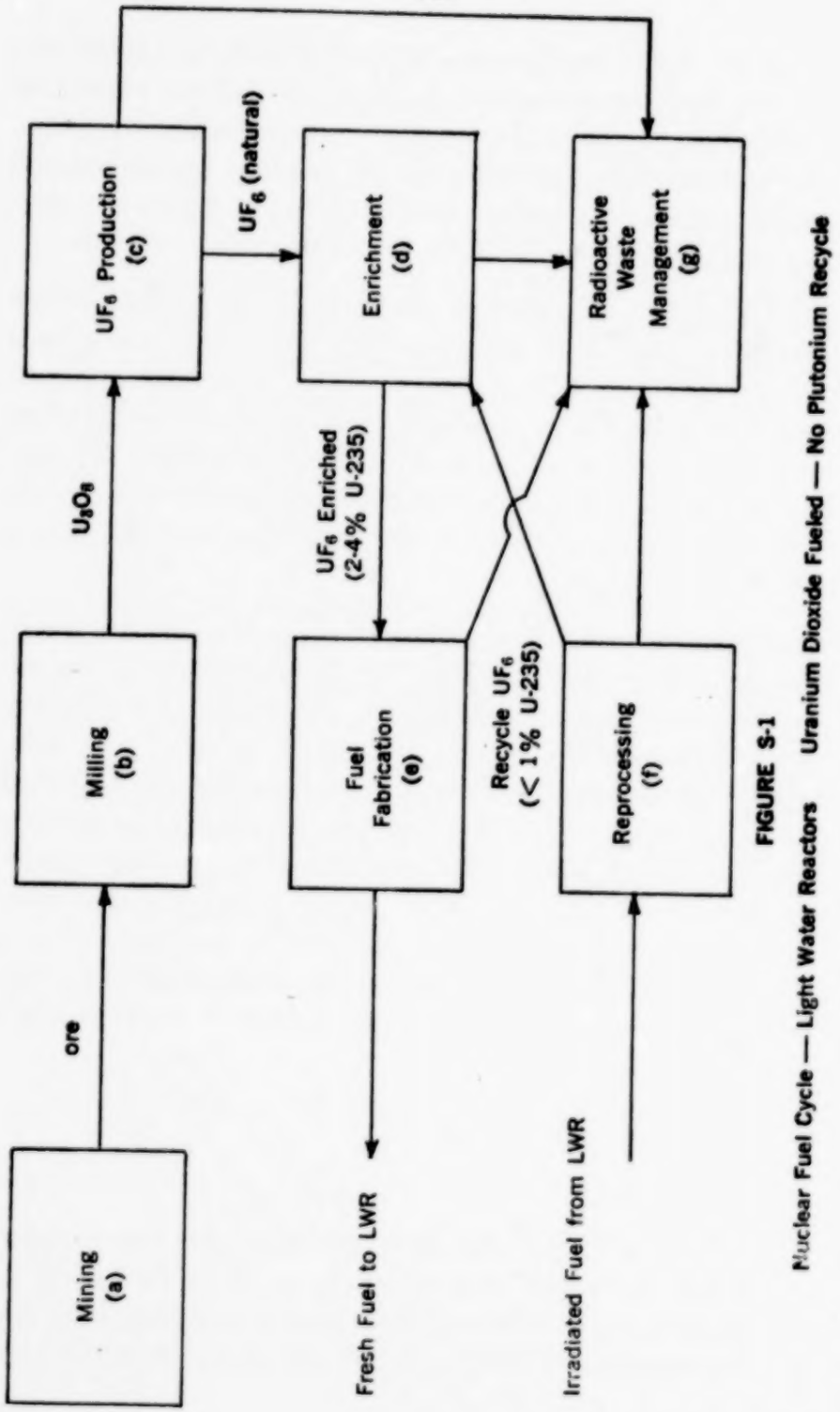

FIGURE S-1

Nuclear Fuel Cycle — Light Water Reactors Uranium Dioxide Fueled — No Plutonium Recycle

As discussed earlier, the environmental considerations relating to the construction and operation of the individual nuclear power plants, including transportation of radioactive materials to and from the power plant, are considered in detailed environmental statements in the separate licensing actions for each individual facility.

The supporting manufacturing operations to the nuclear fuel cycle have been reviewed and those that have been judged to be relatively remote, indirect, and less signficant contributors to the environmental impact of the nuclear fuel cycle have not been included in this statement. Typical operations in this category include production of commercial reagents such as sulfuric acid, hydrogen fluoride, ammonia, nitric acid, etc.

In many instances improvements in technology are available and plans are underway for incorporating these advances into production facilities. However, the primary basis of the present survey is today's industry with only minimal allowances for advances that may be accomplished in the future. In line with Commission practice, standards and criteria relating to fuel cycle facilities are continually evaluated and modified as appropriate to reflect experience, changing technology, and expansion of the industry. Thus, future environmental evaluations should also reflect continuing changes and advances as they affect the current mode and level of operations.

3. *Nuclear Industry Models*

(a) Model LWR

A "model LWR" was developed to relate the environmental considerations of the supporting fuel cycle to the annual operation of a nuclear power plant. In the development of this model, the requirements for each

step of the fuel cycle have been reviewed for the current generation of 1000 MWe boiling water reactors (BWR) and pressurized water reactors (PWR). Both of these classes of LWR's utilize fuel in the form of sintered uranium dioxide pellets encapsulated in either stainless steel or zircaloy tubing. The maximum requirements in each step of the fuel cycle used to define the model LWR are listed in the first two columns of Table S-1 for both an initial core loading and an annual fuel reload along with fuel performance parameters used to define fuel requirements.

The useful life of LWR's has been estimated at between 30-40 years. For purposes of this analysis, a 30-year life has been conservatively assumed in defining the "annual fuel requirement" for the model LWR. The model LWR annual fuel requirement is defined as the sum of one initial core loading plus 29 annual reloads, averaged over the 30-year life of the plant, and is listed for each step of the fuel cycle in the third column of Table S-1. In discussing the environmental considerations of the nuclear fuel cycle steps in subsequent sections, resource use and effluent quantities have been related to this annual fuel requirement.

TABLE S-1

CHARACTERISTICS OF MODEL LWR (1000 MWe)
MAXIMUM FUEL CYCLE REQUIREMENTS

	Initial Core	Annual Reload	Lifetime Average Annual Fuel Requirement
Irradiation level (MWD_t/MTU) x 10^{-3}	24	33	33
Fresh fuel assay (wt% U-235)	2.6	3.2	3.2
Spent fuel assay (wt% U-235)	0.76	0.84	0.84
Ore supply (MT) x 10^{-3}	332	82.5	91
Yellowcake U_3O_8 supply (MT)	665	165	182
Natural UF_6 (MT)	840	250	270
Separative work (MT SWU)	304	110	116
Enriched UF_6 (MT)	200	47	52
Enriched UO_2 (MT)	152	36	40
Fuel loading (MTU)	134	32	35

Bases
Reactor plant load factor — 80%
Enrichment tails assay — 0.25%
No plutonium recycle
Reloads include recovered uranium
Losses of 1% each in fuel fabrication and reprocessing

MT = metric ton = 2205 lbs.
MTU = metric ton uranium
MT SWU = separative work units in metric tons

(b) Model Fuel Cycle Facilities

In some steps of the fuel cycle, numerous plants utilizing a wide variety of alternative processes and operations are involved. To evaluate environmental effects on a generic basis, a model fuel cycle facility for each component of the fuel cycle was defined.

Where industry has used one predominant method or one type of facility, that method or facility has been defined as the model facility. Where a single predominant operation has not been used, the mode of operation that imposes the most significant impact on the environment has been selected as the model. In some cases, where the nature of the impact from two or more modes of operation differs significantly, the aggregate operation of all plants, normalized to an appropriate annual capacity, has been selected as the model fuel cycle facility. The model fuel cycle facilities are not intended to represent particular plants. However, the models were selected to be representative of the industry and to lead to conservative or pessimistic assessments of the environmental considerations.

In the case of mining, milling, fuel fabrication, and radioactive waste management, the above approach resulted in the adoption of representative individual facilities as the model facilities. The UF_6 production model is a composite of the total industry complex of two plants that are presently in operation. The isotopic enrichment model is the total government-owned, contractor-operated complex of three plants as it essentially exists today. The reprocessing model is a composite of the total industry complex of three plants as they are planned for operation in the middle of this decade. Table S-2 gives the annual capacity of each

model fuel cycle facility and relates this capacity to the annual fuel requirement of the model LWR.

TABLE S-2

NUCLEAR FUEL CYCLE CAPACITIES RELATIVE TO THE ANNUAL FUEL REQUIREMENTS OF A MODEL LWR

	Fuel Cycle Plant Annual Capacity		Equivalent Number of Model LWR Annual Fuel Requirements
	Range	Model	
Uranium Mine (MT ore) x 10^{-3}	250-750	480	5.3
Uranium Mill (MT U_3O_8)	500-1100**	960	5.3
UF_6 Production (MTU)	5000-10,000	5000	27.5
Isotopic Enrichment (MT SWU)	6000-17,000	10,500*	90
UO_2 Fuel Fabrication (MTU)	300-1000	900	26
Spent Fuel Reprocessing (MTU)	300-1500	900	26

* Current operating level of industry and assumed model plant capacity.

** Characteristic of about 70% of current facilities.

The lifetime of each model fuel cycle facility was estimated to relate the land use to the model LWR annual fuel requirement. These estimates are generally 20 years which are on the low side of the expected lifetimes, so that the resulting land use numbers are conservative.

4. *Approach to the Assessment of Environmental Considerations*

A detailed environmental review of an industrial process effluents involves the consideration of three components. These are (1) a source term or rate of effluent release, (2) a dilution term, or dispersion of the effluent throughout the medium under consideration, and (3) a population term, giving the distribution of human beings or biota affected by the effluent. To evaluate environmental impact, these factors must be combined.

In this broad survey of environmental considerations, the nuclear fuel cycle is treated on a generic basis. This approach permits an overview of the entire industry without keying the study to particular plants and manufacturers. In order to compensate for the lack of specific detail, effluent concentrations, radiation dose rates, and human population densities appropriate to the model fuel cycle facilities are estimated in each section.

Whenever possible, the environmental considerations have been related to the annual operation of a model LWR. This has been accomplished by normalizing the land use, water use, fossil fuel use, and effluent releases (including chemical, radiological, and thermal) to the model LWR annual fuel requirement, defined above in part 3.a of this section. The summary tables in each section, and the main summary table in this section, present the environmental considerations on this normalized basis.

It is recognized that the considerations presented in the summary tables may not adequately express the actual environmental impact of the fuel cycle. Accordingly, this information has been supplemented with concentrations and dose rates and compared with applicable and available

standards.[1] These additional considerations are presented in the summary text in each section, as well as in the summary text in part 5 of this Section. Whereas the information presented in the summary table is normalized to the annual operation of a model LWR, it is unrealistic to express concentrations, dose rates, and postulated accident effects on this basis. Accordingly, these considerations are based upon the nominal operation of the model fuel cycle facilities.

Estimates of effluent concentrations and radiation doses at the site boundaries of the model fuel cycle facilities are based upon experimental data or calculated values. Where measurements are available these data have been used. In most cases, however, it has been necessary to calculate these quantities, based upon estimated release rates and a model for dispersion. For the fuel reprocessing step, detailed analyses have been made of atmospheric dispersion in conjunction with the NEPA review and the preparation of the detailed environmental statement for specific plants. Therefore for that step in the nuclear fuel cycle the discussion is based upon actual meteorological conditions at the specific sites. For other components of the fuel cycle, for which no such data were available, an atmospheric dispersion model suitable for reactor accident analyses has been employed. This model utilizes X/Q values which are 1/10 of those given in AEC Safety Guide No. 3,[2] as recommended for realistic environmental evaluation in proposed Annex to Appendix D of 10 CFR 50.[3]

[1] Most commonly used Federal, State and international standards were utilized for both radiological and non-radiological effluents.

[2] 4-30 day release curves in Safety Guide 3, Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors, USAEC, 2 Nov. 1970.

[3] Consideration of accidents in Implementation of the National Environmental Policy Act of 1969; Proposed Annex to Appendix D, 10 CFR 50; 1 December 1971.

Where measured or estimated concentrations of chemicals in surface waters were available, these concentrations have been compared with the recommended criteria contained in the Water Quality Criteria "Green Book."[4] This volume represents the most comprehensive document on water quality requirements, and is used as a basic reference by agencies engaged in water quality standards setting activities. The recommended criteria are for source water which is to be subjected to normal water supply treatment prior to consumption as drinking water.

Airborne effluent concentrations have been compared with current EPA National Secondary Ambient Air Quality Standards,[5] where these are available. Secondary standards are designed to protect the public welfare from any known or anticipated adverse effects associated with the presence of air pollutants in the ambient air. For sulfur oxides, the secondary standard is 0.02 ppm, annual arithmetic mean, and for nitrogen dioxide it is 0.05 ppm annual arithmetic mean.

It is important to note that the discussion of environmental considerations in this document is confined to off-site effects; occupational health and safety of on-site workers are given major consideration by the AEC in detailed safety licensing reviews for individual facilities.

5. *Summary of Environmental Considerations*

The principal environmental considerations for each component of the nuclear fuel cycle, and the aggregate con-

[4] Water Quality Criteria; Report of the National Technical Advisory Committee to the Secretary of the Interior; U. S. Federal Water Pollution Control Administration; Washington, D. C., April 1, 1968.

[5] National Primary and Secondary Ambient Air Quality Standards, published by the Environmental Protection Agency, Federal Register, Volume 36, Number 84, April 30, 1971.

sidérations, normalized to the annual fuel requirement of a 1000 MWe model LWR, are summarized for the nuclear fuel cycle in Table S-3. Table S-3A similarly summarizes the considerations for each step in the nuclear fuel cycle.

(a) Use of Natural Resources

(1) Land

The temporary land commitment amounts to 63 acres per annual fuel requirement for the model LWR. More than 70% of this land is an undisturbed area or which maybe withdrawn by fencing from active use by human habitation. The fencing also restricts migration of large animals. Approximately 18 acres are transformed from their original state by the construction of facilities. Less than 5 acres of land are permanently committed to the production of the annual fuel requirement for a model LWR.

At any time, the total temporary land commitment required by the fuel cycle to support a 1000 MWe LWR is about 750 acres. The total permanent land commitment, assuming a 30-year reactor life is about 140 acres.

To cast the land requirements into further perspective, a coal-fired power plant of 1000 MWe capacity requires the disturbance of approximately 200 acres per year for strip mining alone. The disturbed area for the nuclear fuel cycle amounts to approximately 18 acres per annual fuel requirement of a model LWR, which is less than 10% of the equivalent annual coal mining land commitment or equivalent to a 90 MWe coal-fired powerplant fuel requirement.

TABLE S-3

Summary of Environmental Considerations For Nuclear Fuel Cycle
(Normalized to Model LWR Annual Fuel Requirement)

	Total	Maximum Effect per Annual Fuel Requirement of Model 1000 MWe LWR
NATURAL RESOURCE USE		
LAND (acres)		
Temporarily committed	63	
Undisturbed area	45	
Disturbed area	18	Equivalent to 90 MWe coal-fired power plant
Permanently committed	4.6	
Overburden moved (MT x 10^{-6})	2.7	Equivalent to 90 MWe coal-fired power plant
WATER (gallons x 10^{-6})		
Discharged to air	163	~2% of model 1,000 MWe LWR with cooling tower
Discharged to water bodies	11,052	
Discharged to ground	123	
Total	11,338	<4% of model 1,000 MWe LWR with once-through cooling
FOSSIL FUEL		
Electrical energy (MW-hr. x 10^{-3})	317	<5% of model 1,000 MWe LWR output
Equivalent coal (MT x 10^{-3})	116	Equivalent to the consumption of a 45 MWe coal-fired power plant
Natural gas (scf x 10^{-6})	103	<0.2% of model 1,000 MWe LWR energy output

TABLE S-3 — (cont.)

Summary of Environmental Considerations For Nuclear Fuel Cycle (Normalized to Model LWR Annual Fuel Requirement)

EFFLUENTS — CHEMICAL (MT)	Total	Maximum Effect per Annual Fuel Requirement of Model 1000 MWe LWR
[1] Gases (including entrainment)		
SO_x	4400	
[2] NO_x	1170	Equivalent to emissions from 45 MWe coal-fired plant for a year.
Hydrocarbons	11.3	
CO	28.7	
Particulates	1156	
Other Gases		
F^-	0.7	Principally from UF_6 production and enrichment— Conc. within range of state standards-below level that has effects on human health.
Liquids		From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constituents that require dilution and the flow of dilution water are: NH_3 — 600 cfs; NO_{-3} — 20 cfs; F — 7 cfs
$SO_4^=$	5.8	
NO_3^-	26	
Fluoride	0.4	
Ca^+	5.4	
Cl^-	8.2	
Na^+	13.5	
NH_3	10	
Fe	0.4	

[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.2% from natural gas use and process.

TABLE S-3 — (cont.)

Summary of Environmental Considerations For Nuclear Fuel Cycle (Normalized to Model LWR Annual Fuel Requirement)

	Total	Maximum Effect per Annual Fuel Requirement of Model 1000 MWe LWR
Tailings Solutions ($\times 10^{-3}$)	240	From mills only — no significant effluents to environment.
Solids	91,000	Principally from mills — no significant effluents to environment.
EFFLUENTS — RADIOLOGICAL (curies)		
Gases (including entrainment)		Principally from mills — Maximum annual dose rate <4% of average natural background within 5 miles of mill. Results in 0.06 man-rem per annual fuel requirement. Due to dilute concentration and short half-life of principal component, exposure beyond a 5-mile radius is miniscule relative to natural background.
Rn-222	83	
Ra-226	0.02	
Th-230	0.02	
Uranium	0.046	
Tritium ($\times 10^{-3}$)	15.7	Principally from fuel reprocessing plants — Whole body dose is 4.4 man-rem for population within 50-mile radius. This is <0.005% of average natural background dose to this population.
Kr-85 ($\times 10^{-3}$)	350	
I-129	0.002	
I-131	0.02	
Fission Products	1.0	
Transuranics	0.004	

TABLE S-3 — (cont.)

Summary of Environmental Considerations For Nuclear Fuel Cycle
Normalized to Model LWR Annual Fuel Requirement

Liquids	Total	Maximum Effect per Annual Fuel Requirement of Model 1000 MWe LWR
Uranium & daughters	2.4	Principally from milling — included in tailings liquor and returned to ground — no effluents; therefore, no effect on environment.
Ra-226	0.027	From UF_6 production-concentration <5% of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	0.27	
Th-234	0.01	From fuel fabrication plants-concentration <10% of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Other uranium daughters	0.01	
Ru-106	4	From reprocessing plants-maximum concentration <4% of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (x 10^{-3})	2.5	
Solids (buried)		
Other than high level	1200	From mills-included in tailings returned to ground-no significant effluent to the environment.
THERMAL (BTU x 10^{-9})	3370	<7% of model 1,000 MWe LWR.

TABLE S-3A

Summary of Environmental Considerations For Nuclear Fuel Cycle
Normalized to Model LWR Annual Fuel Requirement

Natural Resource Use	A Mining	B Milling	C UF_6 Prod.	D Enrich-ment	E Fuel Fab.	F Reproc-essing	G Waste Manage-ment	H Transpor-tation	Total
Land (Acres)									
Temporarily Committed	55	0.5	2.5	0.8	0.2	3.9	—	—	63
Undisturbed Area	38	0.2	2.3	0.6	0.16	3.7	—	—	45
Disturbed Area	17	0.3	0.2	0.2	0.04	0.2	—	—	18
Permanently Committed	2	2.4	0.02	0	0	0.03	0.2	—	4.6
Overburden moved (MT x 10^{-6})	2.7	—	—	—	—	—	—	—	2.7
Water (gallons x 10^{-6})									
Discharged to air	—	65	3.7	90	—	4.0	—	—	163
Discharged to water bodies	—	—	41	11000	5.2	6.0	—	—	11052
Discharged to ground	123	—	—	—	—	—	—	—	123
Total Water	123	65	44.7	11090	5.2	10.0	—	—	11338
Fossil Fuel									
Electrical energy (MW-hr x 10^{-3})	0.25	2.7	2.1	310	1.7	0.45	—	—	317
Equivalent Coal (MT x 10^{-3})	0.09	0.97	0.76	113	0.62	0.16	—	—	116
Natural Gas (scf x 10^{-6})	—	68.5	31	—	3.6	—	—	—	103

TABLE S-3A — (cont'd)
Summary of Environmental Considerations For Nuclear Fuel Cycle
Normalized to Model LWR Annual Fuel Requirement

	A	B	C	D	E	F	G	H	
	Mining	Milling	UF_6 Prod.	Enrich-ment	Fuel Fab.	Repro-cessing	Waste Manage-ment	Transpor-tation	Total
Effluents									
Chemical (MT)									
Gases(1)									
SO_x	3.5	37	29	4300	23	6.2	—	—	4400
NO_x	0.9	15.9(2)	10(3)	1130	6	7.1(4)	—	—	1170
Hydrocarbons	0.009	1.3(2)	0.6(2)	11	0.06	0.02	—	—	13.0
CO	0.02	0.3	0.2	28	0.15	0.04	—	—	28.7
Particulates	0.9	9.7	7.6	1130	6	1.6	—	—	1156
Other Gases									
F^-	—	—	0.11	0.5	0.005	0.05	—	—	0.7
Liquids									
$SO_4^=$	—	—	—	5.4	—	0.4	—	—	5.8
NO_3^-	—	—	—	2.7	23	0.2	—	—	26
Fluoride	—	—	—	—	0.4	—	—	—	0.4
Ca+	—	—	—	5.4	—	—	—	—	5.4
Cl−	—	—	—	8.2	—	0.02	—	—	8.2
Na+	—	—	—	8.2	—	5.3	—	—	13.5
NH_3	—	—	—	—	10	—	—	—	10
Tailings Solutions (x 10^{-3})	—	240	—	—	—	—	—	—	240
Fe	—	—	—	0.4	—	—	—	—	0.4
Solids	—	91,000	40	0.2	26	—	—	—	91,000

(1) Estimated effluents based upon combustion of equivalent coal for power generation
(2) Combined effluents from combustion of coal and natural gas
(3) 25% from natural gas use
(4) 77% from process

TABLE S-3A — (cont'd)
Summary of Environmental Considerations For Nuclear Fuel Cycle
Normalized to Model LWR Annual Fuel Requirement

	A	B	C	D	E	F	G	H	
	Mining	Milling	UF_6 Prod.	Enrich-ment	Fuel Fab.	Repro-cessing	Waste Manage-ment	Transpor-tation	Total
Effluents (cont'd)									
Radiological (Curies)									
Gases (including entrainment)									
Rn-222	—	74.5	—	—	—	—	—	—	83
Ra-226	—	0.02	—	—	—	—	—	—	0.02
Th-230	—	0.02	—	—	—	—	—	—	0.02
Uranium	—	0.03	0.014	0.002	0.0002	—	—	—	0.046
Tritium (x 10^{-3})	—	—	—	—	—	15.7	—	—	15.7
Kr-85 (x 10^{-5})	—	—	—	—	—	350	—	—	350
I-129	—	—	—	—	—	0.002	—	—	0.002
I-131	—	—	—	—	—	0.02	—	—	0.02
Fission Products	—	—	—	—	—	1.0	—	—	1.0
Transuranics	—	—	—	—	—	0.004	—	—	0.004
Liquids									
Uranium & Daughters	—	2	0.33	0.02	0.02	—	—	—	2.4
Ra-226	—	—	0.027	—	—	—	—	—	0.027
Th-230	—	—	0.27	—	—	—	—	—	0.27
Th-234	—	—	—	—	0.01	—	—	—	0.01
Tritium (x 10^{-3})	—	—	—	—	—	2.5	—	—	2.5
Other Uranium daughters	—	—	—	—	0.01	—	—	—	0.01
Ru-106	—	—	—	—	—	4	—	—	4
Solids (buried)									
Other than high level	—	1200	0.3	—	0.06	—	—	—	1200
Thermal (Btu x 10^{-9})	—	69	30	3200	9	61	—	0.03	3370

(2) Water

Water is used in the nuclear fuel cycle both as a coolant and for process requirements. Water uses have been grouped into three categories based upon the method of return of the water to the biosphere. Water is evaporated into the air, discharged into water bodies or is returned to the ground.

The largest quantity of water involved is the 11 billion gallons required to remove the waste heat from the power stations supplying electrical energy to the enrichment step of the nuclear fuel cycle in the production of an annual fuel requirement. Assuming once-through cooling at these power stations, all of this water is returned to surface water bodies. An additional 338 million gallons of water are directly involved at the fuel cycle plants for cooling, process, and dewatering requirements, totaling 11.3 billion gallons of water moved in producing the annual fuel requirement for the model LWR.

In order to remove the waste heat from a 1000 MWe nuclear power plant on a once-through basis, approximately 300-400 billion gallons of water are pumped annually. Thus, the total demand for water in the components of the nuclear fuel cycle constitutes less than 4% of the water requirement of a 1000 MWe LWR.

The largest single direct dissipation of water by evaporation in the nuclear fuel cycle is for process cooling in the enrichment step. The gaseous diffusion plants evaporate approximately 90 million gallons of water to the atmosphere per model

LWR annual fuel requirement. This constitutes approximately 55% of the 163 million gallons of water discharged to the atmosphere in the nuclear fuel cycle. As a point of reference, a 1000 MWe LWR utilizing cooling towers would evaporate approximately 7 billion gallons of water per year to the atmosphere or more than 40 times the evaporative use of water by the nuclear fuel cycle to produce the fuel for a year's operation.

The requirement for uranium mine drainage moves over 120 million gallons of water per model LWR annual fuel requirement. However, minimum depletion is involved, since the water is pumped from the bottom of the mine pit to the ground surface for return to ground water at some other location with some being returned to the atmosphere by evaporation.

(3) Other

The uranium enrichment component of the nuclear fuel cycle requires over 98% of the electrical energy required by the fuel cycle. The total electrical requirements are 317 x 10^3 MW-hr for the annual fuel requirement of a model LWR. A 1000 MWe LWR would produce 7 million MW-hr in annual operation at a load factor of 80%. Thus the electrical requirements of the nuclear fuel cycle to produce fuel for this reactor are less than 5% of the energy produced by the reactor in a year's operation.

At present most of the electricity generated in the United States is produced in plants that burn fossil fuels. Assuming that coal comprises the bulk of fossil fuel utilization, the electrical energy require-

ments of the fuel cycle correspond to the consumption of 116 x 10^3 MT of coal. A 1000 MWe coal-fired station consumes approximately 2540 x 10^3 MT of coal annually. Thus, the nuclear fuel cycle for a model 1000 MWe LWR consumes about the quantity of coal required for a 45 MWe fossil-fueled plant.

Additionally, approximately 100 x 10^6 scf of natural gas are consumed for process heat, most of which is used in the milling operation. This quantity of natural gas could be used to generate roughly 10,000 MW-hr of electricity, which is less than 0.2% of annual output of the model LWR.

(b) Effluents

(1) Chemical

(i) Gaseous

At present, most of the power plants that supply electricity to the fuel cycle operations burn coal. Consequently, the combustion products of coal comprise nearly all of the airborne chemical effluents attributable to the fuel cycle and approximate the effects from the operation of a 45 MWe coal-fired power plant for a year. The main contributor to these gaseous effluents is the uranium enrichment step, which consumes over 98% of the electrical energy required by the fuel cycle. The existing plants draw power from the grids of large utilities; thus, no single power supply source can be identified with the gaseous effluents. To the extent that power is supplied by nuclear power plants, the total quantity of sulfur dioxide, nitrogen oxides, hydrocarbons, carbon monoxide, and airborne particulates would be greatly reduced.

Fluorine is introduced into the fuel cycle during the UF_6 production step and is removed from the fuel material in the fuel fabrication step. As a result, fluorine becomes an airborne effluent from several steps of the nuclear fuel cycle. Although most of the fluorine gaseous wastes are effectively removed by scrubber treatment systems, approximately 0.7 MT per model LWR annual fuel requirement is released to the environment as an airborne contaminant. To put this quantity into perspective, the estimated fluoride emissions from four major industries are given in Table S-4.

TABLE S-4

ESTIMATED FLUORIDE EMISSIONS FROM MAJOR U. S. INDUSTRIES

Source	Emissions MT/yr.
Phosphate Industry (principally fertilizer manufacture)	17,000
Aluminum Manufacture	15,000
Steel Manufacture	39,000
Brick, tile, glass manufacture	19,000
TOTAL	90,000

Assuming a nuclear power generation industry of 140 model LWR's by 1980, approxi-

mately 100 MT of gaseous fluorides would be released annually by the entire nuclear industry at that time. This constitutes about 0.1% of the total annual quantity of fluoride emissions from the total of the industries noted in Table S-4.

Despite the trivial nature of this effluent in comparison with other major industries, the airborne fluoride release from the nuclear fuel cycle could constitute a potential for adverse environmental impact. Measurements or calculations of airborne fluoride concentrations at the site boundaries of specific plants fall within the range of 0.005-2.0 $\mu g/m^3$. For perspective, these concentrations are well below the level of observed adverse effects on human health, and they span the range of existing state standards.[6] State standards are used for comparison because there are no applicable Federal Standards.

At uranium mills and UF_6 production plant sites, the combustion of natural gas for process heat is a source of nitrogen oxide release to the environment. Dispersion calculations indicate that annual mean NO_x concentrations are within the EPA air quality standards of 100 $\mu g/m^3$. That standard, according to the Environmental Protection Agency, is adequate to protect the public welfare from any known or anticipated adverse effects associated with the presence of oxides of nitrogen in ambient air.

[6] State of Washington: 0.5 $\mu g/m^3$
State of Pennsylvania: 5.0 $\mu g/m^3$

(ii) Liquid

The largest quantity of liquid effluents, 240 x 10^3 MT of waste solutions per annual fuel requirement, contains sulfuric acid and other spent chemicals from the milling processes. This waste liquor, however, is discharged to the tailings pond, and since it does not normally contaminate unrestricted ground or surface bodies of water, it does not actually become an effluent stream.

Significant quantities of a number of chemicals are discharged in liquid effluents from the enrichment, fuel fabrication and reprocessing steps. The concentrations of fluorides, nitrates, and ammonia contained in the liquid waste streams from the model fuel fabrication plant are a possible source of adverse environmental effect. Dilution of these constituents by the receiving body of water by 1-3 orders of magnitude may be required to achieve drinking water source quality, depending upon the flow rate of the receiving body of water, its upstream quality and its downstream use. Efforts are in progress to minimize these releases from existing plants.

The liquid effluent quantities from enrichment appear large but generally are of chemicals that do not constitute a potential for adverse environmental effect and are at much lower concentrations. The enrichment step contributes the largest total quantity of liquid contaminants, but the concentrations of potential contaminants in the effluent streams are generally within the range of permissible stan-

dards.[7] Additional dilution by about 700 times by the receiving body of water decreases the concentrations well below acceptable levels. The release of hexavalent chromium, although small in quantity (<¼ MT/yr. from the model plant), is a potential concern and treatment facilities are being planned to reduce this effluent. Dilution of the iron concentration, a restrictive species, to approximately 0.003 ppm in the receiving bodies of water is two orders of magnitude below the recommended criteria.

In addition, small quantities of fluoride and nitrate wastes are contained in the liquid effluents from UF_6 production plants, while nitrates, sodium, chloride, and sulfates are the principal contaminants in liquid effluents from fuel reprocessing operations. In both cases, dilution in receiving rivers is adequate to reduce the incremental increase in concentration of these species to fractions of a ppm, and at least an order of magnitude below Water Quality Criteria, U. S. Department of the Interior, April 1, 1968.

(iii) Solid

The greatest bulk of solid materials is generated in the open pit mining and milling operations. The barren rock and earth overburden produced by the mine temporarily constitute a waste material, but are essentially returned to the barren mine as backfill and have not been considered as an effluent. The tailings from the mill are composed primarily of sand-

[7] Water Quality Criteria, U. S. Department of the Interior, April 1, 1968.

stone and clays and constitute the major quantity (91,000 MT) of solid waste from the fuel cycle. They are pumped as a slurry to the tailings pond, where they are permanently stored as solids in a chemical form similar to their original condition, but containing slightly less radioactivity, since uranium has been removed.

The 50 tons of ash generated by the hydrofluor UF_6 production process consists of nonvolatile fluorides. Since the ash residue contains traces of radionuclides, it is packaged and shipped for burial at a licensed commercial disposal site and thus does not become an effluent to the environment.

Most of the fluorine added to the fuel cycle during the UF_6 production step is removed and precipitated as CaF_2 in the fuel fabrication step. The 26 MT of precipitated calcium fluoride per annual fuel requirement, occupying a volume of approximately 11 cubic yards, is buried in trenches on the site of the fuel fabrication plant and covered with backfill.

(2) Radiological

(i) Gaseous

The most significant gaseous radiological release from the fuel cycle derives from the fuel reprocessing step. Nearly all of the krypton-85, most of the tritium (in the model plant, 13% of the tritium is released to the watershed), minute quantities of radioiodine, other fission products, and transuranic particulates created

in the nuclear reactor fuel are released to the atmosphere from the reprocessing plant operations. However, the estimated annual radiation doses from the model plant to an individual at the site boundary are approximately 1.0 mrem to the whole body, 1.0 mrem to the bone, 15.5 mrem to the thyroid, and 14 mrem to the outer layer of skin. The thyroid dose is approximately 1% of the guideline limits recommended by the International Commission on Radiological Protection.

The long-term equilibrium buildup of Kr-85 in the atmosphere, due to one model 1000 MWe LWR, will eventually contribute approximately 80 man-rem annual whole body exposure to the entire population of the northern hemisphere (4 billion people). For comparison, the annual population dose to the same number of people from natural background radiation is approximately 500 million man-rem.

Small quantities of uranium and its daughters are released to the atmosphere in several steps of the fuel cycle. Data are unavailable for the total quantity of activity released from the mining operation, but attempts to measure radon concentrations in an open-pit mine revealed no significant alpha concentrations. Estimates of the site boundary concentration of thorium-230 from the model mill are approximately 15% of the 10 CFR 20 limit. In all other cases, the concentrations of uranium and its daughters are estimated to range from 1-4% of the 10 CFR 20 limits for unrestricted areas.

(ii) Liquid

In the fuel reprocessing for a model LWR annual fuel requirement, approximately 2500 curies of tritium and 4 curies of ruthenium-106 are released in the liquid effluent from the model plant. Because of the effect of dilution of receiving streams, measurements in 1971 indicated that the maximum off-site concentrations of each species were less than 4% of the 10 CFR 20 limits.

Small quantities of uranium and its daughters are released in liquid effluents from each step of the fuel cycle. In the mining operation, several curies of activity are dissolved and suspended in the mine drainage water and returned to the ground. At the mill, approximately 2 curies of activity per annual fuel requirement are discharged in the tailings solution and thus are returned to their point of origin in the ground. In the remaining components of the fuel cycle, small quantities of radioactivity are released to receiving bodies of water. Off-site measurements in the vicinity of a UF_6 production plant indicate that annual mean radionuclide concentrations are maintained below 5% of the 10 CFR 20 limits. Estimates of the concentrations of radionuclides in effluent streams from enrichment and fuel fabrication plants indicate that concentrations are below 1% and 10% respectively of the 10 CFR 20 limits before dilution in receiving waters.

(iii) Solid

The most significant solid radiological waste consists of the fission products separated from the spent fuel of an annual fuel requirement in the reprocessing operation. These high level wastes will be stored on-site for a maximum of 10 yrs., and will ultimately be shipped, probably by rail, to a Federal storage facility. This Federal facility will be established to store and manage high level solid wastes under constant surveillance for up to 100 years, or until such time as a more permanent Federal repository can be established. The facility will be designed to prevent the release of any radioactive material to the environment under all credible environmental conditions and human actions. Therefore, such wastes will not be released as effluents to the environment.

The fuel element hulls and other fuel element parts contaminated with trace quantities of uranium, transuranics and fission products will be buried on-site at the reprocessing facility in a retrievable form and may be eventually shipped to a Federal storage facility. Other low specific activity material, such as laboratory wastes, may be buried on-site or at a commercial burial ground.

Other than high activity solid wastes from UF_6 production, fuel fabrication, and reprocessing facilities amounting to a few curies per annual fuel requirement are packaged and shipped by truck to a licensed commercial burial site. The geological and hydrological

characteristics of these burial sites are such that little or no migration of radioactive material from the site is postulated. The burial sites are enclosed by fences and access is controlled.

The solid waste tailings from the milling operation, which contain most of the uranium daughter products originally in the ore (approximately 1200 curies per annual fuel requirement), are slurried in the waste milling solutions. The solutions are pumped to the tailings retention pond and consequently the activity is contained on-site.

The public is exposed to a small amount of direct radiation exposure during the normal shipment of solid wastes. Approximately 600,000 people along the route of travel will receive a population dose of roughly 0.036 man-rem during the rail shipment of high level solid wastes from the fuel reprocessing plant site to the Federal storage facility. The population dose to approximately 210,000 people from the truck shipments of low specific activity solid wastes to commercial burial sites consists of roughly 0.006 man-rem. These dosages constitute less than 0.0001% of the natural background radiation.

(3) Thermal

Approximately 3.4×10^{12} Btu of waste heat are discharged to the biosphere in the production of a model LWR annual fuel requirement. For purposes of comparison, the waste heat from the annual operation of a 1000 MWe model LWR is ap-

proximately 50 x 10^{12} Btu. Thus, the thermal effluents from the supporting fuel cycle constitute less than 7% of the thermal release from the model LWR.

About 95% of the waste heat from the supporting fuel cycle originates in the uranium enrichment step. In this step, 1.6 x 10^{12} Btu are discharged to water bodies at the supporting electric power stations (assuming that the power stations that supply electricity to the gaseous diffusion plants utilize once-through cooling), 0.5 x 10^{12} Btu are discharged to the atmosphere through the stack at the electric power stations, and 1.1 x 10^{12} Btu are discharged to the atmosphere at the gaseous diffusion plants from cooling towers.

The operation of cooling towers leads to local misting and fogging under certain meteorological conditions. At the gaseous diffusion plants, however, this effect does not extend beyond the site boundaries. The impact of the thermal discharge to water bodies is difficult to estimate, since the power is drawn from the grids of large utility complexes and the heat is dissipated to a number of receiving bodies of water.

(c) Accident Considerations

The history of the nuclear fuel cycle to date indicates that accidents in fuel cycle facilities which could result in significant effects on the off-site environment are highly improbable. This record of the commercial nuclear fuel cycle industry has been accomplished by the consideration of safety as a controlling factor in all its functions. Each applicant in his license application is required to analyze potential conditions that could result in the release of

radioactivity beyond the plant confines and by proper design, construction and operation to minimize such releases. As a further assurance, the Regulatory Staff performs a detailed independent safety evaluation of each commercial fuel cycle facility which includes at least the following elements:

(1) *Site Analysis* — Site conditions such as geography, meterology, hydrology, and seismology are reviewed; in addition, maximum natural phenomena criteria are considered in the case of plutonium plants and reprocessing plants.

(2) *Process Evaluation* — The process flow sheet is reviewed in detail to identify potential effluents and safety problems during normal and abnormal operations.

(3) *Structures and Systems* — The building itself, including modules, layouts, etc., is reviewed for safety, emergency escape, limiting the spread of contamination and prevention and control of fires.

Systems — Ventilation, air cleaning, waste treatment, safety instrumentation and monitoring systems are analyzed for suitability under normal and abnormal conditions.

Equipment — The adequacy and reliability of the process and utility equipment are reviewed including the Quality Assurance (QA) on design, construction, installation, operation, and maintenance. For plutonium conversion and fabrication facilities and for reprocessing plants, Appendix B of 10 CFR 50 covering QA requirements is a requirement.

(4) *Radiation Safety and Nuclear Safety Programs* — The review includes contamination control consid-

erations, ventilation system performance, exposure assessment for workers and control of such exposure. Effluents and effluent treatment and montioring systems for both liquid and gaseous streams leaving the plant are evaluated. Accident analyses that include consideration of criticality, radiation safety, and non-radiation safety problems are performed. In the fuel cycle plants handling special nuclear material, both liquid and solid systems are evaluated for criticality safety.

(5) *Procedures* — The licensee is required to have detailed operating and maintenance procedures. The training and testing programs for operators are reviewed. Particular attention is given to fuel reprocessing plant operators who are tested and licensed by the AEC. The licensee must provide a corporate hazard committee or some similar organization that has responsibility for review of new processes and plant changes. Safety audits of operations are required to be made by the licensee who must report the results of these audits.

Emergency plans are submitted by the licensee and are reviewed for adequacy and detailed coverage. Emergency plans are required for all the special nuclear material plants and for fuel reprocessing plants in accordance with licensing conditions or Appendix E of 10 CFR 50.

(6) *Materials and Plant Protection Evaluation* —In addition to the licensing functions of health and safety evaluation is the safeguards program of the applicant for the control of special nuclear material and the means by which he intends to protect those materials against theft, diversion, or sabotage.

In addition to requirements for care in design, construction, and operations of nuclear fuel cycle facilities, each licensee is required to report incidents to the cognizant AEC Regulatory Operations office which either have or threaten to cause any of the following types of events:

(i) Radiation exposure of individuals beyond stated limits.

(ii) Release of radioactive materials in daily averaged concentrations of more than 500 times limits specified in 10 CFR 20, Appendix B, Table II.

(iii) A loss of operations of any affected facility for a period of greater than one day.

(iv) Damage to property of over $1000.

The information in these reports is used as a basis for corrective action to prevent similar events from occurring in existing plants and is taken into account in the licensing actions on new or modified facilities of a similar nature. Such information is also evaluated to determine the need for new or modified standards and criteria.

The effectiveness of these measures to date is borne out by the fact that the incidents which have occurred in fuel cycle facilities in this country to date have neither resulted in significant injury nor endangered the health of any individual in the general public. Nevertheless, for each licensed operation of the fuel cycle, a series of potential accidents with environmental effects judged to range from trivial to serious have been postulated and evaluated in the safety analysis that is performed before the individual facility license is issued. Records to date indicate few if any of the routine type accidents involving special nuclear material have had any measurable effects on the environment. Thus, the review of accidents for this statement has

been concentrated upon the most serious accidents that either have occurred or realistically can be postulated. The estimated radiological environmental effects of the most significant of these accidents are summarized in Table S-5 which lists the resulting calculated radiation exposure in unrestricted areas.

TABLE S-5

SUMMARY OF OFF-SITE EXPOSURES FROM POSTULATED ACCIDENTS

Accident	Fuel Cycle Component	Calculated Off-Site Exposure (rem)	Principal Affected Organ
Criticality Incident[8]	Fabrication	6.6	Thyroid
		1.3	Whole-body
UF_6 Cylinder Rupture	UF_6 Production	0.4	Bone
UF_6 Cylinder Rupture	Fabrication	0.1	Bone
Criticality Incident	Reprocessing	0.04	Thyroid
UF_6 Loadout System Leak	Reprocessing	0.01	Bone
Storage Pool Cooler Leak	Reprocessing	0.01	Bone

No criticality incident has occurred in the United States during the processing of low enrichment uranium.[9] Equipment design, system parameters, and administrative procedures in fuel cycle facilities handling enriched uranium require that two independent errors be necessary for the occurrence of an accidental criticality, reducing the probability of an accidental criticality event to an extremely low value. The resulting dose from such a highly unlikely criticality incident is considerably greater than the annual dose from background radiation; however, it is lower than the maximum annual dose permitted by 10 CFR 20 for occupational exposure.

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[8] Very improbable, has never occurred with low enriched uranium.

[9] Although no such incident in the rest of the world is known to us, our information may be incomplete.

A rupture or valve failure in a UF_6 cylinder is unlikely, but incidents of this nature have occurred in the past. An accident of this type could occur under varying conditions at a UF_6 plant, enrichment plant, or fuel fabrication facility. In estimating the off-site doses from this postulated accident, assumptions were made regarding the quantity released, the effectiveness of filters, and meteorological conditions. The calculated radiation doses are higher than the average annual dose from natural background radiation but are within the limits of 10 CFR 20 for unrestricted areas. The postulated accident at the UF_6 plant results in the highest off-site effects since it is assumed that the UF_6 cylinder malfunction occurs out-of-doors. Additionally, the fluoride release associated with the accident could result in some localized injury to plant life.

The accidents which were hypothesized for the mining, milling and waste management components of the fuel cycle do not result in significant off-site releases, or at worst entail limited decontamination efforts in the immediate vicinity of the site. The Federal facility for the interim storage of high level wastes will be designed to withstand all natural forces and man-created accidents so that there will be no significant release of radioactive materials to the environment outside of the facility.

It is estimated that 1.2 accidents involving truck shipments of non-enriched fuel cycle material could occur per thirty year lifetime of a model LWR. The low specific activity of the materials would limit the effects of a breach of containment to minor consequences. The likelihood of a criticality incident occurring during a truck shipment of fissile material is estimated to be infinitesimally small. Finally, it is estimated that 0.05 rail accidents involving the shipment of a high level wastes to a Federal storage facility might occur per thirty year lifetime of a model

LWR. Containers for high level waste must be designed and constructed to withstand accidents likely to be encountered in transport.

6. *Overview of Total Nuclear Fuel Cycle*

The environmental effects of the total nuclear fuel cycle have been estimated for mid-1972 and for the projected installed nuclear power generation capacity for 1979-1980. In mid-1972 approximately 10-12,000 MWe of nuclear electric generation capacity is estimated to be in operation in the United States. The projected installed nuclear electric generation capacity for 1980 is 140-150,000 MWe. Table S-6 summarizes industry demands and the number of plants for each fuel cycle step operating in 1972 and estimated required capacity and number of plants required to service the 1980 nuclear electric power generation industry. The environmental considerations for operations have been summarized in Tables 0-4, 0-5, 0-6, 0-7, 0-8, and 0-9. These data characterize the environmental effects of each individual fuel cycle plant. The environmental effects of the total fuel cycle may be obtained by combining the data in Table S-6 for the required number of plants with the corresponding information from Tables 0-4 through 0-9.

Uranium Mining

The existing uranium mining industry can produce about 30% more ore than is required by the nuclear electric generation capacity on-line today. By the end of the decade, the required mining rate must triple to meet the demand. Since the bulk of the known reserves are in New Mexico, Wyoming, Texas, Colorado and Utah, it is expected that the mines will be concentrated in that area. The only anticipated change in mining techniques is that a greater fraction of the ore mined in 1980 may come from underground

TABLE S-6

TOTAL NUCLEAR FUEL CYCLE INDUSTRY

Types of Plants	1972 Plant Size Thousands of MT	1972 Annual Requirement Thousands of MT	1972 No. of Average Plants Required to Meet Power Demand	1980 (est.) Annual Requirement Thousands of MT	1980 (est.) No. of Average Plants Required to Meet Power Demand
Uranium Mines — Ore	250–750	4,500	10 (220)*	17,000	30–40
Uranium Mills — U_3O_8	0.5 – 1.1	9	12 (20)*	34	40–45
UF_6 Production — U	5–15	8	1+ (2)*	34**	3 Low Enriched Plants & 3-4 Natural Plants
Isotopic Enrichment SWU	7.5	5	1 (3)*	20	3
Fuel Fabrication — U	0.3 – 1.2	1.2	3+ (10)*	5.3	8–10
Fuel Reprocessing — U	0.3 – 1.5	0.2	1 (2)*	3	3–4

* Number in parenthesis is number of plants actually available.

** Including recycle of recovered U from reprocessing operations.

Nuclear Power Generation Basis: 10-12,000 MWe 1972
140-150,000 MWe 1980

mines, since a larger percentage of reserves are found at depths only amenable to underground mining.

Uranium Milling

The uranium milling industry is capable of supplying about twice today's nuclear power generation requirements of yellowcake. By 1980, the yellowcake demands are expected to quadruple. It is expected that the number of mills will more than double but it is likely that the technology employed will be similar to today's. The new mills are expected to be located in the Western States in the vicinity of mining operations.

UF_6 Production

It is anticipated that the 1980 requirements for UF_6 can be met by planned UF_6 conversion operations at the reprocessing plants and increases in the plant capacity of the existing facilities and by construction of several new UF_6 plants. No technological advance is forecast at this time.

Isotopic Enrichment

Planned improvements to the government owned complex of isotope enrichment plants will permit the existing plants to supply the amount of separative work required to service the 1980 installed nuclear electrical generation capacity. Since some of the electrical supply for the isotope separation plants is planned to come from nuclear power by 1980, it is estimated that there will be no increase in the gaseous chemical effluents from the enrichments plants despite a 70% increase in separative work capability.

Fuel Fabrication Plant

The fuel fabrication plant industry is presently serviced by 10 plants, some of which are not expected to be in use in

1980. A total of 8 to 10 production plants, having a combined throughput of over 5000 MTU of fuel per year, will be required to service the 1980 industry. There are new processes under development in the conversion portion of the fuel fabrication step of the fuel cycle. These new processes are expected to reduce substantially most of the chemical process effluents from fuel fabrication.

Fuel Reprocessing

Three fuel reprocessing plants either exist or are under construction in 1972. It is expected that one additional plant will be built and operating in 1980 to meet the reprocessing load. No major technological advances for these plants are predicted.

Waste Management

The volume of other than high level wastes, i.e., those which may be buried in commercial burial grounds, will increase in about the same ratio as nuclear generation capacity. It is expected that the existing burial grounds will be adequate to handle the 1980 volume of wastes. At the present time and through 1980 high level wastes may be stored at the fuel reprocessing plant site as liquids and solids. This on-site storage does not impose significant environmental effects.

It is expected that by 1980 the Federal storage facility for storage of solidified high level wastes will be under construction. Hence, at some time after 1980, the high level wastes as solids will be transferred from the reprocessing plant to the Federal facility.

Transportation

At the present time, the transportation needs of the fuel cycle supporting the installed nuclear electric generation

capacity can be met by about 500 truck shipments per year on public highways. The movement of low specific activity material accounts for most of that total. By 1980, the number of truck shipments could exceed 7000, however, the use of rail transport may reduce this volume of highway movements. The amount of material shipped will continue to be an inconsequential fraction of the total transportation industry.

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F. IRRADIATED FUEL REPROCESSING

1. *Summary*

(a) General

Fuel reprocessing recovers the unused fissile material and separates the fission products from the spent fuel discharged by the power reactor. By the middle of the 1970's, three reprocessing plants, with an estimated combined annual capacity of 2700 MTU may be in operation in the United States. The three reprocessing plants are generally similar in regard to process technology, all using mechnical means for cladding destruction and adaptations of the Purex process for a part or all of the separations.[1]

The collective operation of the three plants, normalized to an annual capacity of 900 MTU/yr, is selected as the model reprocessing plant. This capacity is equivalent to the annual fuel requirements of approximately 26 model LWR's.

(b) Environmental considerations

The major environmental considerations associated with irradiated fuel reprocessing, normalized to a model LWR annual fuel requirement, are summarized in Table F-1 and as follows:[2]

TABLE F-1

Summary of Environmental Considerations For Irradiated Fuel Reprocessing (Normalized to Model LWR Annual Fuel Requirement)

	Total
Natural Resource Use	
Land (acres)	
Temporarily committed	3.9
Undisturbed area	3.7
Disturbed area	0.2
Permanently committed	0.03
Water (gallons x 10^{-6})	
Discharged to air	4.0
Discharged to water	6.0
Total	10.0
Fossil Fuel	
Electrical energy (MW-hr x 10^{-3})	0.45
Equivalent coal (MT x 10^{-3})	0.16
Effluents	
Chemical (MT)	
Gases	6.2
*SO_x	6.2
**NO_x	7.1
*Hydrocarbons	0.02
*CO	0.04
F^-	0.05
Liquids	
Na^+	5.3
Cl^-	0.2
$SO_4^=$	0.4
NO_3^- (as N)	0.2
Radiological (Ci)	
Gases (including entrained matter)	
Tritium (x 10^{-3})	15.7
Kr-85 (x 10^{-3})	350
I-129	2.4 x 10^{-3}
I-131	2.4 x 10^{-2}
Fission products	1.0
Transuranics	4 x 10^{-3}
Liquids	
Tritium (x 10^{-3})	2.5
Tu-106	4
Therma' (Btu x 10^{-9})	61

*Estimated effluent gases from combustion of equivalent coal for power generation.

**23% of total is estimated effluent gas from combustion of equivalent coal for power generation.

(1) Use of Natural Resources

The temporary land use of 3.9 acres comprises roughly 6% of the land use for the total fuel cycle. About 95% of this land use is a fenced in buffer zone and is not disturbed. Less than 0.03 acre per annual fuel requirement is permanently committed. The water use of 10 million gallons comprises about 3% of the water use for the total fuel cycle. Approximately 40% of the water is redistributed through evaporation. The electrical energy requirement of 450 MW-hr. comprises approximately 0.15% of the consumption of electrical energy in the total fuel cycle and is equivalent to the output of the model LWR for less than ½ hr.[3]

The fuel reprocessing component of the nuclear fuel cycle contributes significantly to the conservation of natural resources. The values recovered from the spent fuel can be measured in terms of about 30,000 MT of conserved uranium ore and bred and recovered fissile material worth $1.75 million per model LWR annual fuel requirement.[4]

(2) Effluents

The total radioactivity of airborne radioactive effluents from fuel reprocessing is large in comparison with the remainder of the fuel cycle. Assuming that all of the Kr-85 and tritium produced in the nuclear power plant fuel is released during the fuel reprocessing step, the estimated annual whole-body exposure at the site boundary from gaseous effluents is less than 1% of the natural background radiation throughout most regions of the country.[5] The release of radioiodine could result in an estimated maximum dose to the thyroid which is approximately 1% of the guideline limits recommended by the International Commission on Radiological Protection. Moreover, the long-term build-up of Kr-85 in the atmosphere could eventually contribute approximately 80 man-rem annual whole body exposure, per model 1000 MWe LWR, to the entire world population of the northern hemisphere (4 billion people).

Nearly all of the fission products created in the nuclear reactor are removed from the uranium in the fuel reprocessing step. The activity of the fission products 150 days after discharge from the model reactor is reduced by radioactive decay to roughly 150 megacuries per model LWR annual fuel requirement.[6] The high-level wastes containing most of this radioactivity are stored as liquids in carefully designed, built and monitored tanks, within vaults, at the fuel reprocessing site for up to 5 years after separation. Eventually they will be converted to inert solids, and willbe shipped to a Federal interim storage facility within 10 years after separation, and thus isolated from the environment.[7]

Only one of the three plants comprising the irradiated fuel reprocessing industry discharges radionuclides to the watershed. According to measurements made in 1971 the maximum concentrations of tritium and Ru-106 released in this manner did not exceed 4% of 10 CFR 20 annual average concentration limits in off-site waters.[8]

Oxides of nitrogen and fluorides are the most significant gaseous chemical effluents from the fuel reprocessing plant. However, the estimated concentrations of NO_x at the site boundaries are more than two orders of magnitude below the 100 $\mu g/m^3$

EPA standard, and the predicted concentrations of fluorides are within the most restrictive State standard of 0.5 $\mu g/m^3$.[9] One of the plants comprising the irradiated fuel reprocessing industry releases chemicals to off-site waters. The incremental increase in concentrations in the receiving waters is roughly 1 ppm or less, a negligible amount for the chemical species involved.

Some heat, much of it originating from the decay of fission products in stored high level wastes, is discharged to the atmosphere. This thermal effluent amounts to slightly over 1% of that for the total fuel cycle.

(3) Accident Considerations

Fuel reprocessing plants are designed to assure adequate margins of safety to prevent accidents, and to assure that acceptable protection systems will function reliably to mitigate the consequences of accidents if they should occur as a result of multiple failures of systems or procedures that are provided to prevent accidents. A broad spectrum of accidents are analyzed, which range from minor process leaks or spills of radioactive material within the plant and/or its laboratory to credible major accidents such as, but not limited to, criticality incidents, solvent fires, hydrogen explosions, ion exchange resin fire, and typical accidents related to the handling and storage of radioactive materials. Credible accidents are treated as if they might occur during the life of the plant (irrespective of their low probability of occurrence) and the environmental consequence of the release of chemical or radioactive material that might result if the accident should occur is analyzed.[10]

The most significant accidental off-site exposure could result from an accidental criticality incident in these plants. If such an event were to occur, an individual at the site boundary could receive a dose to the thyroid of approximately 40 mrem.[11] In general, other postulated accidents could result in off-site exposures of 10 mrem to the bone of individuals near the site boundary via inhalation and ingestion of fission product and transuranic radionuclides dispersed into the atmosphere by accidental releases. It is significant to note, however, that in more than 25 years of fuel reprocessing experience using similar processes at government owned plants, there has been no accident that has resulted in the release of radioactivity to the off-site environs. Based upon the extensive safety measures instituted in new commercial facilities, at least as good a safety record is expected.

2. *Description of the Irradiated Fuel Reprocessing Industry*

Irradiated fuel reprocessing recovers usable fissile material from spent reactor fuel elements. During the operation of a reactor, the buildup of fission products and depletion of fissile material requires that the operator replace between one-fifth and one-third of the fuel elements annually and redistribute the other partially spent fuel in the reactor core. The discharged fuel elements contain about one-third of the uranium-235 that was in the fuel prior to irradiation, and the fissile plutonium that was produced from uranium-238 during irradiation. At present, the recovered uranium-235 is recycled in reactor reload fuel. In the future, the bred plutonium may be used as LWR reload fuel

or as fuel in liquid metal fast breeder reactors. At present, the plutonium is isolated and stored.

There are economic and technical considerations which favor recovery and recycle of fissile material from the spent fuel elements. The net value of the residual fissile material, allowing for costs associated with reprocessing, waste disposal, and transportation services, is approximately $50,000 per ton of irradiated fuel. Based on 35 metric tons of uranium reprocessed per year in support of a model 1,000 MWe LWR, the reclaimable fissile material has a net worth of about $1.75 million dollars. These economic savings are reflected in lower electric power costs. The recovered fissile material from an annual fuel requirement also represents the conservation of natural resources equivalent to approximately 30,000 MT of uranium ore.[12]

At present there are three fuel reprocessing plants in operation or being constructed in the United States. One plant has been in operation since 1966. Another is nearly completed and will be ready for operation in late 1972. The third plant is in an early stage of construction and scheduled for operation in late 1974. The three plants have a combined design capacity to meet the projected needs for fuel reprocessing services until late in the 1970's.[13]

The first commercial fuel reprocessing plant, the Nuclear Fuel Services (NFS) facility, can process irradiated light-water power reactor fuels at the rate of 1 MTU/day. In anticipation of the need for additional commercial services, NFS is giving consideration to increasing the plant's capacity to 900 MTU/year (3 MTU/day).

The second commercial fuel reprocessing plant, the Midwest Fuel Recovery Plant (MFRP), will be ready for operation in late 1972. It has a design capacity of approximately 300 MTU/yr.

The Barnwell Nuclear Fuel Plant (BNFP), which will be the third irradiated fuel reprocessing plant, is in its early stages of construction. It is scheduled to begin operating in late 1974, and will have sufficient capacity to process 1500 MTU/yr.

Each of these plants is located on a relatively large, remote site. Site location, size and demography data for each plant are given in Table F-2. In general, the three fuel reprocessing plants are similar in respect to process technology. All plants utilize mechnical means for breaking up the fuel elements and chemical systems for recovering special nuclear material which are adaptations of the Purex process, for which the technology and risks are well defined. However, specific methods applied for mechanically disassembling the fuel elements, dissolving fuel materials, and applying separation technology to recover fissile materials differ somewhat from plant to plant.

Spent fuel element assemblies are received at the reprocessing plant via truck or rail in heavily shielded shipping casks. The assemblies are spaced arrays of sealed tubular rods containing UO_2 pellets which have been partially transformed into PuO_2, fission product oxides, and gases by irradiation. The tubes encapsulating the fuel are made of zircaloy or stainless steel.

After storage to permit short half-life radionuclides to decay (150 days), the fuel elements are

TABLE F-2

IRRADIATED FUEL REPROCESSING PLANTS
SITE DATA AND DEMOGRAPHY[14]

Plant and Location	Site Size, Acres	Population Density people/sq. mi.	Nearby Population Centers		
			City	Population	Distance, Miles
Nuclear Fuel Services, West Valley, N.Y.	3350	90	Buffalo	463,000	28
			West Valley	<1,500	4
Midwest Fuel Recovery Plant — Morris, Ill.	890*	150	Morris, Ill.	8,000	8
			Joliet, Ill.	79,000	15
			Aurora, Ill.	74,000	27
Barnwell Nuclear Fuel Plant — Barnwell, S.C.	1700**	35	Barnwell, S.C.	4,500	7.5
			Aiken, S.C.	16,000	26
			Augusta, Ga.	60,000	33

*Adjacent to the Dresden nuclear reactor site of 2,230 acres.

**Adjacent to AEC Savannah River Plant exclusion area.

chopped into short pieces, exposing the metal oxides. The metal oxides are leached by hot nitric acid, leaving behind the chopped tubing (hulls). The hulls are soaked in hot nitric acid and water to assure that essentially all of the uranium, transuranics and fission products have been removed. The nitric acid solution, containing uranium, transuranics and fission products, is adjusted chemically and processed through solvent extraction and ion exchange systems. These process steps separate the fission products, uranium, and plutonium, from each other. The purified uranium product is converted to uranium hexafluoride (UF_6) and is shipped to the gaseous diffusion plant for reenrichment. The purified plutonium product will be stored pending conversion to PuO_2 for use in future plutonium recycle or breeder reactor fuel elements.

Each of the plants has gaseous, liquid low-level and solid wastes as illustrated in Table F-3. All gaseous effluents will be discharged to the atmosphere via off-gas treatment and filtering systems, which are designed to remove over 99.9% of the radioactive iodine gas and the radioactive fission product and transuranic particulates. The plants release krypton 85 to the environment at rates ranging from 0.1 to 0.4 Ci/sec. Moreover, the MFRP and BNFP facilities will also discharge tritium oxide in water vapor to the atmosphere at rates of 0.007 to 0.018 Ci/sec.[15] About 40% of the tritium from the NFS plant is released, with other treated low-level wastes, to a creek which eventually flows into Lake Erie about 39 miles from the site. NFS is the only fuel reprocessing plant that adds radioactivity to the liquid effluent from the plant. The

TABLE F-3

IRRADIATED FUEL REPROCESSING PLANTS

MAJOR WASTE SYSTEMS[15]

Plant	Gaseous Effluents	Liquid Wastes		Solid Wastes[3]
		High-Level	Other Than High-Level	
NFS	To atmosphere via Iodine Scrubber, HEPA filters, 61 meter stack	Stored onsite as neutralized liquid in tanks in vault[1]	Tritium and Ru-106 controlled release to creek	Stored onsite in drums in impervious clay deposits
MFRP	To atmosphere via Iodine Scrubber, sand filter, 91 meter stack	Converted to solid. Stored onsite in containers under water in storage basin	Stored onsite in tanks in vault as immobile salt cake	Stored onsite in underground lined vault
BNFP	To atmosphere via Iodine Scrubber, HEPA filters, 100 meter stack	Stored onsite as acidic liquid in tanks in vault[2]	Stored onsite in tanks in vault	Stored onsite in underground concrete drums

(1) Plans underway to add tanks for storage of high-level liquids in acidic conditions with ultimate conversion to solids for transfer to a Federal storage facility.

(2) Plans for solidification of high-level liquid wastes for transfer to a Federal storage facility.

(3) All facilities ship other than high-level solid wastes to commercial burial grounds for long-term storage, with the exception of hulls and fuel hardware which are stored onsite as indicated above.

MFRP and BNFP will discharge cooling water effluent which under normal operating conditions will not contain added radioactivity.

Each plant has provisions for complete containment of high-level liquid wastes in high integrity tanks in vaults or as an immobile solid as shown in Table F-3. The plans vary somewhat, but all result in total retention of the high-level wastes with no release to the environment. Within five years all high-level liquids will be converted to solids and within ten years will be transferred to a Federal storage facility for long-term confinement.[17] Solid waste materials such as hulls and fuel hardware are stored onsite in underground vaults, concrete containers or in impervious soil.[18] Other low-specific activity solid wastes are packaged and shipped to commercial burial grounds for long-term storage. There will be essentially no release of solid radioactive wastes to the off-site environment from any plant.

Plans are under way or under consideration for all three of the plants to process the recovered uranium values to hexafluoride to be recycled through the gaseous diffusion plants. Uranium hexafluoride production results in some non-radioactive chemical effluents of fluoride bearing compounds. The recycled uranium can represent as much as one-third to one-fourth the amount of natural feed to the enrichment operation, so that the potential impact of the fluorination operation at the reprocessing plant corresponds to a fraction of the total environmental impact associated with UF_6 production.

Pending development of a future market for the plutonium product recovered by reprocessing nuclear power reactor spent fuel, the fuel reprocessors tentatively plan to store the plutonium product for the utilities as part of their services. The plutonium product can be stored safely in special containers and facilities specifically designed for this purpose. The storage of plutonium product at the reprocessing site has been considered in licensing safety evaluations and with respect to the environmental impact of irradiated fuel reprocessing as a whole.

By 1975, the annual quantities of plutonium recovered by reprocessing nuclear power reactor spent fuel will be in the range of 2-3 metric tons; by 1980 about 15 metric tons; and will increase more rapidly thereafter.[19] The feasibility of using about 3 weight percent plutonium in a mixed plutonium-uranium oxide fuel for LWR's has been demonstrated.[20] However, the prospective utilization of such plutonium recycle fuel is somewhat uncertain since the actual timing and the extent to which the recovered plutonium will be recycled is an economic matter to be considered by each utility. Moreover, although several firms have indicated plans to provide production-scale, mixed oxide fuel fabrication plants by 1975 or 1977, the present capability for fabricating such fuel is limited. Accordingly, pending development of the plutonium recycle economy, limited means for storing the recovered plutonium product inventory will be provided at the three reprocessing plants.

The New York State Atomic and Space Development Authority (ASDA) has constructed a plu-

tonium storage facility, for the above purpose, at its Western New York Nuclear Service Center, West Valley, New York.[21] This facility is specifically designed to eliminate the possibility of any significant radiation exposure, criticality incident, or other accidents that might be related to the storage of plutonium in sealed containers. It can store 2 metric tons of plutonium as nitrate in a nitric acid solution. The plutonium nitrate solution is contained as follows: (a) in a 10-liter polyethylene bottle, (b) that is sealed within a 304 L stainless steel 14-gauge tubular capsule, (c) which is inserted in an eight-inch thick annulus of reinforced concrete with seven-inch thick reinforced concrete bottom and top cover disks, and (d) all of the above are contained within a sealed steel drum. Approximately 1000 such containers can be stored in this facility. Similarly, General Electric Company and Allied-Gulf Nuclear Services plan initially to store Class 1 shipping containers of plutonium nitrate solution within respective protective areas of the MFRP and BNFP.[22]

As the rate of plutonium generation increases due to additional LWR's being placed in operation, other more economical means could be provided for the storage of the larger inventories of recovered plutonium product. At that time, bulk quantities of plutonium nitrate solutions could be stored in vessels within confinement structures specifically designed and constructed for that purpose, or the plutonium nitrate solution could be converted to plutonium dioxide, a solid, which can be sealed in containers and stored in vaults specifically designed and constructed for that purpose. The timing for the start of use of recovered plutonium and the

rates for either recycle or storage will be dependent upon an analysis of many changing factors. At this time it is not feasible to make firm projections concerning use of recycle plutonium in LWR's beyond the indication that some recycle may be accomplished by the end of this decade.

3. *Description of the Irradiated Fuel Reprocessing Model*

The mechanisms for discharge of effluents from the three fuel reprocessing plants differ somewhat. For this reason, and because it is likely during the remainder of this decade that these facilities will comprise the entire fuel reprocessing industry in the U.S., the collective operation of the three plants is chosen as the basis for the fuel reprocessing model.

The model plant is defined to have a capacity of 900 MTU/yr and the environmental releases and other related considerations are taken to be one-third of the aggregate for the entire industry. This capacity is equivalent to the annual fuel requirements of approximately 26 model LWR's. The model plant occupies a 2,000 acre site and operates for at least 20 years.

4. *Environmental Considerations*

a. Use of Natural Resources

(1) Land

Nearly all of the 2,000 acre site is only temporarily committed. Of this, approximately 100 acres are disturbed by plant construction and 1,900 acres remain an undisturbed exclusion area.[23]

At the end of its useful life, if necessary, the facilities can be dismantled and much of the area reclaimed. The area occupied by the plant itself and

waste disposal areas probably could not be restored to its original condition. A conservative estimate is that an area of approximately 15 acres would be permanently committed.

(2) Water

Operations at the model plant will require water at the rate of approximately 600 gpm. This is equivalent to 10 million gallons of water per model LWR annual fuel requirement. Of this, about 6 million gallons is returned to the surface water and about 4 million gallons is released to air via evaporation and drift from the cooling tower.[24]

(3) Other

The power required to operate the model reprocessing plant is approximately 1.3 MWe. The energy required to produce the annual fuel requirement for the model LWR is 450 MW-hr, which corresponds to the consumption of 160 MT of coal at a fossil fuel fired plant producing this energy.[25]

b. Effluents

(1) Chemical

(i) Gaseous

The chemical off-gas effluents from irradiated fuel reprocessing are oxides of nitrogen, fluoride (associated with UF6 production), and combustion products from the plant's steam generators. The quantity of NO_x released from the model reprocessing plant is approximately 185 MT annually.

Extensive analyses have been made of the expected concentrations of airborne chemical

effluents at the site boundary for the individual fuel reprocessing plants. The calculated site boundary NO_x concentrations are in the range of 0.1-1.0 $\mu g/m^3$. These concentrations are orders of magnitude lower than the EPA standard, an arithmetic mean concentration of 100 $\mu g/m^3$.[26]

Fluoride in reprocessing plant off-gases originates almost entirely from uranium hexafluoride production. The quantity of fluoride released from the model plant is estimated to be approximately 1 MT annually. The calculated fluoride concentrations at the site boundaries are below the most stringent state standard for fluoride release, an arithmetic mean concentration of 0.5 $\mu g/m^3$ (State of Washington).[27]

(ii) Liquid

Only one of the three plants releases significant quantities of chemicals in liquid effluents. Table F-4 gives the most significant of these effluents. The estimated release rates are normalized to the capacity of the model reprocessing plant. This table also gives the maximum incremental increase in concentrations in offsite receiving waters. The incremental concentration increases are negligible.[28]

TABLE F-4

IRRADIATED FUEL REPROCESSING PLANTS
CHEMICALS IN LIQUID EFFLUENTS

Species	Annual Release* MT/yr	Incremental Increase in Concentration in Receiving Water Δppm
Sodium	137	1.3
Chloride	6.3	0.06
Sulfate	11.3	0.1
Nitrate (as Nitrogen)	4.8	0.04

*Normalized to the annual 900 MTU/yr capacity of the model plant.

(2) Radiological

(i) Gaseous

An irradiated fuel reprocessing plant releases airborne effluents containing krypton-85, tritium and minute quantities of radioactive iodine, other fission products and transuranic particulates which might pass through the off-gas treatment and filter systems. Table F-5 summarizes the estimated activity released annually by the model plant, and it relates this activity to the potential maximum exposure to individuals at boundaries of the plants' exclusion areas. These exposure estimates are a) uncorrected for shielding that would be provided by clothing and buildings, b) uncorrected for occupancy time in the area and, c) assume that a child ingests milk contaminated with radioiodine from a family cow that grazes at the boundaries of the exclusion areas.[29]

On these bases, the annual exposure could be 0.95 mrem to the whole-body, 1.0 mrem to bone,

TABLE F-5

IRRADIATED FUEL REPROCESSING PLANTS
GASEOUS RADIOACTIVE EFFLUENTS[31]

Radionuclide	Exposure Mode	Annual Release* (Ci/yr.)	Exposure** (mrem/yr.)
Kr-85	External irradiation of whole body	9,000,000	0.2
	Irradiation of skin		13.5
H-3	Internal irradiation of whole-body	400,000	0.65
I-129	Irradiation of thyroid	0.060	8.7
I-131	Irradiation of thyroid	0.60	6.0
Other Fission Products	Irradiation of body	25	<0.10
Transuranics	Irradiation of bone	0.10	0.15

*Normalized to the annual 900 MTU/yr. capacity of the model plant.

**Estimated maximum exposure at the site boundaries of the three plants comprising the industry.

15.5 mrem to the thyroid, and 14 mrem to the outer layer of skin. Thus, the whole-body exposure is less than 1% of that from natural background radiation.[30] The exposures projected for skin, thyroid and bone represent approximately 0.5%, 1.0%, and 0.05%, respectively, of the guideline limits recommended by the International Commission on Radiological Protection, Report No. 9.

(ii) Liquids

High level liquid wastes containing more than 99.9% of the nonvolatile fission products are concentrated for storage on site in specially built, contained and monitored tanks for a

maximum of 5 years. This is followed by conversion to inert solid and, after a maximum on-site storage time of ten years, eventual transfer to a Federally designated disposal site. At 150 days after discharge from the reactor, the activity of the irradiated fuel has decreased by radioactive decay to about 4 megacuries of fission products per MTU or 150 million curies per annual fuel requirement. In addition to the fission product content, there will be approximately 3.5 kilograms of plutonium and 350 kilograms of uranium in the wastes from an annual fuel requirement. The total quantity of high-level waste from an annual fuel requirement can be converted to a solid weighing approximately 1.4 to 2.3 MT.[32]

Of the three facilities comprising the irradiated fuel reprocessing industry, only the NFS plant release radionuclides in liquid effluents. This results in an equivalent annual release from the model reprocessing plant of approximately 65,000 curies of tritium and 100 curies of Ru-106. At the NFS site, the concentrations of H-3 and Ru-106 at the point of release from the holding pond exceed the maximum permissible concentrations given by 10 CFR 20 and require dilution in receiving streams, which pass through the site. Receiving stream measurements in 1971 indicated that the concentration of tritium never exceeded 10^{-4} μCi/ml and that the maximum concentration of Ru-106 was 4×10^{-7} μCi/ml. These maximum levels are less than 4% of the limits in 10 CFR 20. The annual average concentrations of tritium and

ruthenium would be expected to be much less than the observed maxima in the receiving stream. Taking into account that the stream is not a potential source of drinking water there is little potential for radiological effects on human beings from this liquid effluent stream.[33]

(iii) Solid

The volume of solid wastes, other than high level wastes, from a model LWR annual fuel requirement is summarized in Table F-6. The undissolved fuel element hulls, containing trace quantities of uranium, plutonium, and fission products, and other fuel element parts

TABLE F-6

IRRADIATED FUEL PROCESSING PLANT SOLID WASTES OTHER THAN HIGH LEVEL LAND BURIAL PER ANNUAL FUEL REQUIREMENT[34]

	Volume
Undissolved fuel element hulls	350–700
Other fuel element parts and discarded equipment	140–230
Laboratory waste, small tools, gloves and clothing	190–1000

will be stored or buried on-site in recoverable form and may eventually be shipped to a Federal repository. Discarded equipment will be decontaminated prior to disposal. Laboratory wastes, small tools, gloves, and clothing may be buried on-site or at a commercial burial ground.

(3) Thermal

The rate of heat dissipation from the model plant will be about 185 million Btu/hr. This is equivalent to 61 x 10^9 Btu per annual fuel requirement. The heat will be discharged to the atmosphere via the off-gas stack, a cooling tower and a cooling pond. All liquids released offsite will be cooled to ambient temperature prior to release.[35]

(c) Accident Considerations[36]

At fuel reprocessing plants, operations having a potential for the occurrence of equipment failures or accidents which could disperse significant amounts of radioactive contaminants are performed within shielded process cells. These cells are designed to maintain adequate confinement capability in the event of accidents or natural phenomena much more severe than has been experienced historically for such plants or in the locality of the plant. It is expected that during the life of the plant, some equipment failures will occur. Accordingly, monitors are provided in the system to detect process or equipment failures and to provide corrective action automatically, or signal a need for corrective action. Moreover, the plant is designed to cope with such failures or accidents, and the cells and equipment are designed so that they can be decontaminated for the repair or replacement of equipment. A ventilation system provides assurance that the contaminated air from within the cells, or from any inadvertent releases within the plant, will be routed through high efficiency filters that remove airborne radioactive particulate before the ventilation air is discharged to the stack. In summary, a fuel reprocessing plant is designed to (a) assure adequate margins of safety to prevent accidents, (b) cope with potential accidents, and (c) mitigate the consequences of accidents if they should occur

as a result of multiple failures of systems or procedures that are intended to prevent accidents.

These plants are analyzed with respect to a wide spectrum of credible accidents and the consequence that might result if an accident should occur. While major equipment failures, or spills of radioactive materials within the plant, might disrupt operations and cause the plant to shut down for cleanup and repair, it is not expected that such occurrences would result in the release of significant amounts of radioactivity so as to contaminate the offsite environs. That is, radioactive contamination would be confined within the process cell, or within the process building, and little if any might escape to contaminate the area in the vicinity of the plant, within the plant's exclusion area. Only a few accidents involving radioactive materials have occurred in existing plants, and none resulted in contamination beyond the immediate vicinity of the plant. The experience gained from these few accidents has resulted in improved safety procedures and features so that the probability of similar occurrences in the future is extremely low. Some examples of the types of accidents that might occur in fuel reprocessing plants, which would have little, if any, discernible impact on the offsite environs, are listed below. This is followed by a brief summary of the more significant potential accidents, irrespective of their low probability of occurrence, and an assessment of the possible consequences if they should occur as a result of multiple failures of systems or procedures that are intended to prevent their occurrence.

The following are examples of types of accidents that are postulated with respect to the analysis of irradiated fuel reprocessing operations. Those listed below are not expected to result in discernible contamination of the environs offsite, nor discernible exposure to the public.

Abnormal Event	Potential Consequence
Drop fuel cask into cask unloading pool	Possible rupture of fuel pins and release of fission gas to atmosphere; contamination of storage pool water.
Fuel element hung up in air during transfer to shear	Possible overheating and rupture of fuel pins; release of fission gas to atmosphere.
Ignition of zirconium fires	Small fire of short duration — little, if any, damage.
Rapid chemical reaction in dissolver	Vessel pressurized, seals blown fission gases released to atmosphere; cell contaminated.
Leak in recovered acid line	Contamination of cell or pipe trench in area of leak.
Leak of any vessel or line confining radioactive material	Contamination of cell or pipe trench; transfer material to spare tank space, decontaminate cell and equipment, repair failure or replace equipment.
Excessive entrainment radioactivity in evaporator overheads	Contamination of recovered acid or effluents, which must be recycled.
Failure of an iodine scrubber	Reduced iodine removal efficiency of backup systems; shutdown plant until adequate efficiency restored.
Filter failure	Detectable increase of radioactivity in stack effluent; shutdown plant and replace filter.
Loss of ventilation zone control differential-pressure	Possible migration of radioactivity from controlled area to limited control area; correct deficiency and decontaminate building area.
Solvent fire	May plug filter, contaminate cell and ventilation exhaust ducts could require extensive cleanup of cell and ducts, and replacement of filter, while plant shutdown for repairs.

Plutonium or waste concentrator explosion	Blowback of air, contamination of cell and possibly adjacent limited control area near cell; could require extensive cleanup of cell and adjacent building area, while plant shutdown for repairs; possible airborne particulate resulting in offsite exposures of less than 1 mrem.
HF tank leak	Air concentration of toxic HF could be lethal to unprotected persons in vicinity of tank; not discernible offsite.

Table F-7 summarizes the possible consequences of the more significant potential accidents, if such accidents could occur, and is followed by a brief discussion of each accident. Even such major accidents, if they should occur, are not expected to result in radiological exposures that would have any discernible effect on the environment.

TABLE F-7
ESTIMATED RADIATION EXPOSURE AT SITE PERIMETER RESULTING FROM POSTULATED ACCIDENTS

Accident	Organ of Greatest Exposure	Organ Dose (rem)
Criticality incident	Thyroid	0.04
Ion exchange resin fire	Lung	0.001
UF_6 loadout system leak	Bone	0.01
Storage pool cooler leak	Bone	0.01
Fuel assembly rupture	Thyroid	0.002

A criticality incident in a reprocessing plant is an unlikely event because the design of equipment and process limitations prevent such incidents. Safe spacing is ensured in storage basins by physically spacing the fuel elements in safe geometry even when dropped. Process systems and controls are designed to prevent assembly of an unsafe array. Nevertheless, a criticality accident is postulated, in which a burst of 10^{18} fissions is assumed. This

yield is approximately an order of magnitude greater than that which has been experienced, on the average, in past accidents. It is further assumed that all noble gases and halogens (or halides) are discharged from the plant stack without taking credit for filters, and that the airborne fission products arrive at the site boundary 15 minutes after the burst. It is estimated that the whole body exposure from gamma radiation to an individual is approximately 3 mrem, and that the dose to the thyroid from radioiodine is 40 mrem.

Similarly, the design of equipment and process limitations prevent the occurrence and limit the consequences of a postulated ion exchange resin fire. However, in postulating a hypothetical ion exchange resin fire, it is assumed that 128 liters of resin, containing 30 gm of plutonium per liter, are contained in the column section that ruptures and burns. On the basis of known filter efficiences and the results of burning experiments with metallic plutonium, it is estimated that approximately 10^{-5} of the plutonium, as insoluble plutonium oxide, passes the filter and is expelled through the stack. The resultant dose to the lung of an individual at the site boundary is estimated to be 1 mrem.

In a postulated UF_6 loadout system leak, 350 kg of UF_6 is assumed to escape as a result of a cylinder valve break at the loading temperature. The specific alpha activity of uranium in fuel irradiated to 33,000 MWd/T is approximately 1.4 Ci/kg. If it is assumed that the UF_6 bypasses the filter and is expelled as UO_2F_2 via the stack, the resultant dose to the bone of an individual at the site boundary is estimated to be approximately 12 mrem.

A leak in the storage pool cooler was postulated. The pool water activity is assumed to be approximately 5×10^{-3} μCi/ml. On the basis of Savannah River contaminant com-

position observations, Ce-144 is chosen to represent the potential hazard of the mixture of contaminants. It is assumed that 1.5 gal/min of cooling water is vaporized during the course of one week. Inspection programs assure detection within one week, and a higher rate of leakage would be detectable earlier. Assuming release outside the containment at ground level in the building wake, the estimated dose to the bone of an individual at the site boundary is approximately 10 mrem.

A fuel assembly rupture is postulated, in which all of the fuel pins in one element rupture under 20 feet of water in the fuel storage pool. One element contains about 0.45 MT of irradiated uranium. The rupture of all of the fuel pins in the element would release approximately one-third of the Kr-85 inventory and 3% of the iodine inventory, i.e., that which had diffused from the fuel into the void space in the fuel element. The gases in the void space would escape and bubble to the surface of the fuel storage pool. However, most of the iodine would be absorbed in the fuel storage pool water. On the basis that one-third of the Kr-85 and 0.1% of the iodine escape to the surface of the fuel storage pool and are exhausted to the atmosphere, the estimated exposure (primarily to the thyroid) of an individual at the site boundary is approximately 2 mrem.

The storage of high-level radioactive wastes in stainless steel tanks within stainless steel lined vaults, with redundant cooling systems, multiple sources of cooling water supply, spare tanks, and elaborate monitoring and alarm systems is deemed to represent a degree of containment as being essentially accident proof.[37] Moreover, these confinement systems are designed and constructed with a high degree of quality assurance to ensure their capability to withstand accidents, earthquake and tornado effects.[38] For these reasons, the probability of an accidental release of radioactivity is considered to be extremely low and thus there would not be any significant release to the environs.

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G. RADIOACTIVE WASTE MANAGEMENT

1. *Summary*

(a) *General*

The radioactive wastes resulting from the nuclear fuel cycle can be categorized as high-level and other than high-level. High-level wastes, generated at fuel reprocessing plants contain fission products separated from fissile material recovered from irradiated fuel. Other than high-level wastes result from operations involving production of UF_6, fuel fabrication, and fuel reprocessing. These include all wastes, regardless of concentration or specific activity, which are not designated as high-level.

Appendix F of AEC regulation 10 CFR 50 requires that the inventory of high-level liquid waste at the fuel reprocessing plant be limited to that produced in the prior 5 years and that it be converted to solid form and be transferred to a Federal repository within 10 years of its separation from the irradiated fuel. The establishment of a Federal repository for long-term storage of high-level wastes is under consideration. Starting about 1980 and until a long-term repository can be established, the Federal government plans to provide an engineered structure facility for interim storage of high-level wastes. This interim facility will be designed with capability for storage of wastes for a 100-year period. The Federal government will have responsibility for care and maintenance over any site at which high-level waste is stored. Control must be maintained as long as any waste is stored in a facility.

Radioactive wastes other than high-level are buried in near-surface shallow trenches, usually in the containers in which they are shipped. There is no intent to recover

the wastes once they are buried. There are 6 commercial land burial sites in the United States authorized to receive and bury other than high-level wastes.

Land used for commercial land burial is owned or controlled by the States. In the event of default or abandonment of the site by the commercial operator, the State is obligated to provide care and maintenance of the site to assure its dedication to radioactive waste burial and to assure it is not used for other purposes.[1]

(b) *Environmental Considerations*

(i) Resource Use

The waste generated as a result of fuel cycle operations will require the commitment of less than 0.2 acre for the storage of both high-level and other than high-level wastes resulting from the model LWR annual fuel requirement.

(2) Effluents

No effluents to the off-site environment are expected to result from burial of waste classified as "other than high level." The Federal repository will safely isolate the high level waste material from the environment.

(3) Accidents

Possible accident effects at commercial land burial facilities would normally be confined to low level contamination of the immediate area of the accident and would not result in release of significant amounts of radioactive material to the environment. However, if there were a release to areas outside the facility, the contaminated areas would be surveyed for radioactivity and decontaminated.

The engineered facility for high-level wastes will be designed to prevent any release of radioactive material either from natural phenomena or man-created accidents.[3] The high-level solid wastes are immobile, stable material, sealed in containers. Should an accident result in the failure of a waste container, the trace amount of radioactivity in the cooling media would be readily detected. The failed waste container would be identified and re-sealed. The cooling media will be routinely monitored and treated to prevent a release of radioactivity to the environs.

2. *Description of the Radioactive Waste Management Industry*

Radioactive waste generated during fuel cycle operations is divided into two categories, high-level and other than high-level. High-level waste is defined in Appendix F, 10 CFR 50, as the aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels. All other waste, regardless of its source, falls into the other than high-level category and may be sent to a commercial land burial facility for disposal.

(a) *Disposal of Other Than High-Level Wastes*

At the present time, there are six commercial land burial facilities which are authorized to receive and bury other than high-level wastes. Five of the sites are on land owned by States and the other site is on land owned by the Federal government and leased to the State. Commercial land burial facilities must be located on land which is owned by either a State or

Federal government.[4] The purpose of this requirement is to assure long-term control of the site in the event of default or abandonment of the site by the commercial operator. It is intended that, after radioactive wastes are buried at the site, the land not be used for any other purpose. The States have the obligation for perpetual care and maintenance of land burial sites to assure their dedication to waste burial and to assure that they are not used for other purposes. Authorization to operate a commercial land burial facility is based on an analysis of nature and location of potentially affected facilities and of the site topographic, geographic, meteorological, and hydrological characteristics, usage of ground and surface waters in the general area, which demonstrate that buried radioactive waste will not migrate from the site.[4]

Monitoring wells are maintained at each burial site and are sampled periodically to determine if there has been any migration of radioactivity. In addition, air and vegetation samples are taken around the site and analyzed for radioactivity. Should any sample reveal an increase in the concentration of radioactive material in an aquifer above that measured prior to commencement of burial operations and it is determined that the radioactivity originated in the burial ground, its significance must be analyzed, corrective actions developed, as appropriate, and the entire matter reported. Corrective actions are subject to approval by the Atomic Energy Commission or an Agreement State and additional corrective measures can be required as a regulatory agency deems appropriate.

To date, there have been no reports of migration of radioactivity from commercial burial sites. In the unlikely event that there would be such a finding, sev-

eral courses of action could be taken. These include: (1) a halt to burial operations, (2) removal of the radioactive material from the burial area in which the radioactivity originated, (3) grouting of the site from which the radioactivity originated, or (4) other such procedures which might be necessary, depending on the extent of migration of radioactivity from the site.

Existing commercial land burial facilities are located in the States of Washington, Nevada, Illinois, Kentucky, South Carolina, and New York. Currently, about 1,000,000 cubic feet of packaged radioactive waste materials are buried per year.[5] It has been estimated that the annual volume will increase to about 2,000,000 cubic feet by 1975 and 4,000,000 cubic feet by 1980.[6]

An average burial trench at a commercial burial site is about 300 feet long, 30 feet wide, and 20 feet deep and has a volume of 180,000 cubic feet.[7] The volume is not completely utilized since there are voids between packages and between packages and earth fill. Assuming 100,000 cubic feet of waste can be stored in a trench, approximately 10 trenches are needed per year to accommodate the current rate of burial of radioactive wastes. The total land area of the six burial sites is about 600 acres.[8] Assuming 50% usage of available land for trenches, this land area would accommodate over 1400 average burial trenches and would provide for burial of 140,000,000 cubic feet of packaged waste.

The commercial land burial sites are located in rural, sparsely settled areas or in virtually uninhabited areas such as the Armagosa Desert in Nevada.[9] The sites themselves are generally isolated so that public access to them is limited. The areas in which wastes are buried are enclosed by fences and access to the sites is carefully controlled by the site operator.

The prime operations at a commercial land burial facility are the receipt, temporary storage, and burial in trenches of packaged radioactive wastes. The packages that are shipped to the burial facilities must meet the requirements of the Department of Transportation (DOT) and the Atomic Energy Commission (AEC) for transportation of radioactive material.[10]

The packages are normally buried as received with no reprocessing or repackaging of package contents. However, in some cases, the primary package containing the waste is shipped in a reusable overpack or secondary container which may be required by DOT regulations for shipment of the particular materials involved. In those instances, the primary package is removed from the reusable overpack before burial of the primary package.

The suitability of a site for burial of radioactive wastes depends on the geological and hydrological characteristics of a site and its ability to retain the radioactive material so that there will be no migration of the radioactive material from the burial site. No credit is taken for containment provided by the packages once they are buried. The purpose of the packages is to provide ease of handling and minimization of personnel exposure and to prevent loss of the radioactive material to the surroundings prior to burial.

The volume of packaged radioactive waste consigned to a commercial land burial facility by the various steps in the fuel cycle is relatively small. There is no packaged waste buried at commercial facilities from operations in the mining, milling, and enrichment steps.

During production of UF_6, waste consisting of such things as rags, sweepings, boxes, piping, etc. contaminated with uranium is generated. The average concentration of the waste is low (a few thousandths of a microcurie per gram) and the volume of packaged waste sent to a commercial land burial facility for disposal amounts to a few thousand cubic feet for the model LWR annual fuel requirement.[11] Fuel fabrication operations generate wastes similar to those generated by UF_6 production facilities.

Fuel reprocessing operations generate wastes consisting of general laboratory waste, small tools, gloves, clothing, etc. contaminated with fission products and/or fissile materials.

The volume of waste generated as a result of reprocessing the spent fuel from a model LWR annual fuel requirement ranges from 200 to 1000 cubic feet, depending on the compaction or other volume reduction methods utilized at the fuel reprocessing facility.[12]

(b) *High-Level Waste Disposal*

Appendix F, 10 CFR 50, requires that the inventory of high-level liquid waste at a fuel reprocessing plant must be limited to that generated in the prior five years. The liquid waste must be converted to dry solids and transferred to a Federal repository no later than ten years following separation of fission products from irradiated fuels. The solids will contain a variety of fission products and will ultimately be in a non-reactive form.

The spent fuel from a model LWR processed annually in a fuel reprocessing plant produces approximately 1000 gallons of radioactive liquid waste which,

when converted to a solid, weighs approximately 1.4 – 2.3 MT.[13] Assuming that this waste is in the form of calcined solids diluted with twice its volume of inert material, it would occupy a volume of approximately 100 cubic feet.

It was planned to construct a Federal repository in a salt mine for long-term geological storage of solid high-level wastes by the mid 1970's. However, subsequent events have deferred the site selection and construction of such a repository.

The present alternative plan is to design and construct a near-surface engineered storage facility capable of safely storing high-level radioactive waste containers for 100 years or until such time as a permanent Federal repository can be established.[14] The Federal government will have responsibility for the care and maintenance for the engineered storage facility which will be used for storage of high-level waste and and the future repository for permanent storage of such waste. The intended life of the engineered storage facility is 100 years: however, the Federal government will have the obligation for care and maintenance as long as any waste is stored in the facility.[15] Although a repository for long-term geologic storage of high-level waste is intended to isolate the waste from man and the biosphere, the Federal government will have the obligation to maintain control over the site in perpetuity.

At this time, the plans for the engineered storage facility are in the development stage and it is not possible to discuss this program in specific terms.[16] The engineered facility will be designed so that solid high-level wastes can be stored without danger to the health

and safety of man and with no unacceptable impact on the environment. The use of man-made facilities for storage of waste requires a greater degree of human surveillance and maintenance than would geologic storage since such facilities are subject to deterioration by the forces of nature and possible deliberate or inadvertent damage by man. Plans will be included in the design of the man-made facilities for the removal of the stored material at some future date to locations that do not require continued surveillance.[17]

When specific plans are developed for either an engineered storage facility or a pilot repository in a geological formation, at that time detailed environmental statements will be issued for each such facility.

3. *Description of Model Waste Handling Facilities*

(a) *Land Burial Facility*[18]

A model land burial facility for other than high-level wastes consists of 100 acres of land located in a rural, sparsely settled area. The site location is near a highway so that there is reasonable access to the site. The site characteristics are such that the ground water is well below the bottom of the deepest trench. The precipitation in the site area is low so that flooding of trenches and leaching of buried radioactive material is minimal. The soil provides good ion exchange characteristics to minimize percolation of radioactivity which may be leached from the solid waste to the ground water. There is no nearby use of ground water or well water downstream from the site. The site and its vicinity have the characteristically slow water movement through the soil in a direction in which there is little or no land use.

Buildings on the site provide space for offices, a laboratory, temporary storage of packaged radioactive wastes, and other waste handling as may be necessary, such as solidification of low concentration liquids. The storage space is also used for storage of vehicles, earth moving equipment, fork lifts, etc., which are necessary for preparation of trenches and handling of packages containing radioactive wastes.

The portion of the site in actual use is fenced so that access to trenches and buildings is prevented. The fence also serves to minimize entry by area wildlife.

The operator of a site has a program for environmental monitoring. This program includes sampling of air, water, and vegetation to determine migration, if any, of radioactive material from the actual location of burial. Records are maintained of the monitoring results.

Trenches which are completed are cared for to minimize erosion and are marked to specify the contents. Packages in partially filled trenches are covered over with earth frequently to minimize access to the waste, provide shielding during placement of packages in the trench, and to minimize entry of water into the trench.

The model facility keeps temporary storage of packages to a minimum. Packages are placed in a trench and covered with earth as soon after receipt as possible.

(b) *High-Level Waste Storage Facility*[19]

A model high-level waste storage facility will be located on government-owned land in a remote, sparsely inhabited area.

The model facility will have storage buildings which are massive structures designed and built to meet a

service life-time of 100 years, to provide a protective barrier against the forces of man and nature, and to provide shielding against the radiation from the stored wastes. The structures will be built and maintained so that they may be kept in serviceable condition beyond the design lifetime.

The facility structures are planned to be in modular form which can accommodate the high-level waste generated as the result of fuel reprocessing. It is estimated that the annual high-level wastes from 250 model LWR's will be stored in one module. The volume of high-level solid wastes resulting from the annual fuel requirement of a model LWR is about 100 cubic feet. Additional modules can be constructed as needed.

About 1,000 acres of land may be committed for the overall site. Only 30 acres are needed for the initial module and supporting structures; however, additional land is needed to accommodate future growth of the facility and to provide a buffer zone around the site. The portion of the site in use will be surrounded by a fence to limit access to the site.

The model facility is planned to have equipment appropriate for the opening and unloading of shipping casks and placement of canisters containing the solid high-level wastes in the storage buildings. Special features will be designed into the storage buildings to protect against all credible accidents. The structures and storage facilities and equipment will be designed to assure that, even if all services including the power are lost, radioactive material will not be released to the environment. The structures will be designed and built to withstand natural forces such as severe storms,

tornadoes, earthquakes, and floods, and all credible actions by man.

4. *Environmental Considerations*

(a) *Use of Natural Resources*

(1) Land Use

The volume of other than high-level packaged radioactive waste which is generated during fuel cycle operations is variable and difficult to estimate. However, the total quantity of radioactive material contained in such wastes is small and amounts to only a few curies. It is estimated that the nuclear fuel cycle activities required to produce the annual fuel requirement for a model LWR will generate about 10 curies of radioactive material in other than high-level wastes. This activity will be contained in wastes sent to commercial land burial facilities for disposal. Assuming an average concentration of radioactivity in the waste of 0.025 microcurie per gram and a waste density of 1 g/cc, the total waste volume will be approximately 14,000 cubic feet. Assuming no further compaction of the waste, the final volume of packages containing the waste could approximate 20,000 cubic feet per annual model LWR fuel requirement.

If the waste is packaged in 55-gallon drums, about 3,000 drums would be needed. If the drums are placed in rows 5 deep and 10 wide in an average 30 foot wide burial trench, 60 rows will be required. Since the drums are 2 feet in diameter, a total area of 3,600 square feet of land surface will be required. This is less than 0.1 acre.

For the solid high-level waste which would be stored in a Federal engineered storage facility, it is estimated that the waste from the annual fuel requirement of a model LWR would be about 100 cubic feet and would be stored in 10 containers. It is estimated that about 2500 waste containers would be stored in the initial module of the engineered structure storage facility on a site occupying about 30 acres. Thus about 0.1 acre of land is required for the interim storage of the annual high-level wastes from the model LWR fuel requirement.

Based on the above estimates, the land area required for disposal of all radioactive wastes from manufacture and reprocessing of a model LWR annual fuel requirement is less than 0.2 acre.

(2) Water and Other Resources Use

There is very little use of water or other natural resources involved in normal operations involving the burial or storage of solid packaged wastes generated as a result of fuel cycle operations.

(b) *Effluents*

(1) Chemical and Radiological

The normal operations involved in the burial of "other than high level" radioactive wastes in solid form are not expected to result in any effluent releases to the off-site environment. The Federal repository will safely isolate the high level waste material from the environment.

(2) Thermal

Due to the very low concentrations of radioactive materials in the other than high-level wastes that

result from nuclear fuel cycle operations, there is essentially no heat release to the environment from these wastes.

The storage of packages containing solid high-level wastes at an engineered facility will result in the release of a small amount of heat. The wastes in each package (about 10 cubic feet) will generate about 2-5 kw of heat, depending on the elapsed time since the material was first created in the reactor.[20] During transfer and storage of packages in the facility, some heat transfe medium will be used to dissipate the heat from the sealed containers.

(c) *Accident Effects*

There have been no accidents at burial grounds under Federal or State jurisdictions that resulted in offsite environmental effects. Some minor accidents have occurred involving materials not utilized in any fuel cycle.

Accidental opening of an other than high-level waste package prior to burial and release of the package contents could occur, however, at a commercial land burial facility. Normally the scattered waste materials would be confined to the fenced facility and the impact on the environment would be negligible. However, even if it is assumed that as much as ⅓ of the waste contained in a 55-gallon drum is released to the unrestricted area, the effect on the environment would be insignificant. The volume of a 55-gallon drum is approximately 2×10^5 cubic centimeters. Using the assumption made previously of a waste concentration of 0.025 microcurie per gram and density of 1 g/cc, the total amount of radioactivity involved is about 1.7 millicuries. If the waste were uniformally dispersed over an area of one acre, the

concentration of the radioactive material would be about 0.04 microcurie per square foot or 4×10^{-5} microcurie per square centimeter. Dispersion over a greater area would result in a proportionally lower concentration. Much of the dispersed material would be in the vicinity of the site which is normally uninhabited and unused. Recovery of the bulk of the scattered waste could easily be accomplished. Radiation surveys could be made and the area decontaminated.

With respect to the engineered structure facility for high-level wastes, the major credible accident would be loss of cooling with concomitant heating and possible failure of the package in which solid high-level waste is contained. The facility will be designed to protect against this type of accident. The facility will be designed to withstand all credible natural forces and man-created accidents so there will be no release of radioactive material outside the facility. The high-level solid wastes are immobile, stable material, sealed in containers. The presence of trace amounts of radioactivity in the cooling media would identify the failure of a waste container. The cooling media will be routinely monitored and treated to preclude any release of radioactivity to the environment. A failed waste container would be repackaged.

REFERENCES

1. See for example letter from State of Nevada Department of Conservation and Natural Resources to USAEC, "Lease Agreement State of Nevada — Nuclear Engineering, Co.," USAEC Docket 27-10 (Feb. 15, 1972).
2. United States Atomic Energy Commission, *Management of Commercial High Level Wastes,* SECY-2371 (March 17, 1972) p. 20.
3. 10 CFR Part 20, Section 20.302.
4. *Ibid.*
5. United States Atomic Energy Commission, *The Nuclear Industry-1971,* WASH-1174-11 (1971) p. 154.
6. *Ibid.*
7. United States Atomic Energy Commission, Land *Burial of Solid Radioactive Wastes: Study of Commercial Operations and Facilities,* WASH-143 (1968) Table 2, p. 33.
8. *Ibid.*
9. *Ibid.*
10. 10 CFR Part 71, 49 CFR Parts 173 and 177.
11. Allied Chemical Corp., "Application for Source Material License, Amendment," USAEC Docket 40-3392, Feb. 17, 1971.
12. Allied-Gulf Nuclear Services, "Barnwell Nuclear Fuel Plant Applicant's Environmental Report," USAEC Docket No. 50-332 (Nov. 5, 1971) Table 3.6-3, p. 76.
13. *Management of Commercial High-Level Radioactive Wastes,* p. 6.
14. *Ibid.,* pp. 13, 16-17.
15. 10 CFR Part 50, Appendix F.
16. *Management of Commercial High-Level Wastes,* pp. 17-20.
17. *Ibid.,* p. 18.
18. The model presented in this section is based on information in *Land Burial of Solid Radioactive Wastes.*
19. The model presented in this section is based on information in *Management of Commercial High-Level Wastes,* pp. 17-20.
20. *Management of Commercial High-Level Wastes,* p. 19.

OVERVIEW OF TOTAL NUCLEAR FUEL CYCLE

The preceding portions of this survey deal with the aspects of the nuclear fuel cycle as related to an individual model LWR. To provide additional perspective on the environmental effects of the nuclear fuel cycle, an overview of the combined effects from the total nuclear fuel cycle industry has been estimated and is included in this section. Since the size and nature of the industry is dependent to a great extent upon the time frame of the evaluation, two time periods have been selected for this overview. The time frames utilized are as follows:

A. Approximately the present date (mid 1972); and

B. The end of this decade (1979-1980).

In order to evaluate the environmental effects of the nuclear fuel cycle, it is first necessary to establish the size of the industry that it serves. At the present time, about 10-12,000 MWe of nuclear electric generation capability is estimated to be operational in the United States. The existing nuclear fuel cycle industry has capabilities that in general are in excess of the requirements for this size power generation capacity. Table O-1 summarizes the capabilities of the present day nuclear fuel cycle industry and relates these capabilities to the needs of today's power generation capacity.

TABLE O-1

NUCLEAR FUEL CYCLE INDUSTRY

1972

Type of Plant	Plant Average Annual Capacity Thousands of MT	Total Industry Annual Capacity Thousands of MT	Approx. Annual Demand from Nuclear Power Generation Thousands of MT	No. of Plants Available	Approximate No. of Plants Req'd to Meet Power Needs
Uranium Mines — Ore	250–750	8200	4500	220	10
Uranium Mills — U_3O_8	0.5–1.1	19	9	20	12
UF_6 Production — U	5–15	19	8	2	1+
Isotopic Enrichment — SWU	6	10	5	3	1
Fuel Fabrication — U	0.3–0.5	3	1.2	10	3+
Fuel Reprocessing — U	0.3	0.15*	0.2	2	1

*One plant in operation for about 6 months

Although other fuel cycle schemes are competing with the LWR concept, it appears that the prevalent method for generation of electrical power by nuclear energy will continue to be light water cooled and moderated uranium fueled reactors through the end of this decade. It is known that some utilities have plans to utilize bred plutonium in the form of mixed oxide LWR reload fuel in the latter part of the decade. Plans are under way for production facilities for this type of fuel which may be in operation during the latter half of the decade and small amounts of this fuel could be available in the period 1976-1978. Based on these plans, production quantities of fuel could be expected to be manufactured by the end of the decade and it appears that perhaps as much as 5% of the total fuel in use by 1980 may be of the mixed oxide (Pu-U) variety. Another fuel cycle is the high temperature gas cooled concept (HTGR). This scheme has not been demonstrated in large scale commercial size units to date. Several commercial size power generation facilities have been committed and are planned to be operational by the end of this decade or the early part of the next. It is estimated that this component of the nuclear power generation capability will be less than 5% (2-3%) of the nation's capacity by 1980. An additional concept for future application is the liquid metal fast breeder reactor (LMFBR). However, it is not expected that any significant application of this concept will be in commercial use by 1980. A commercial scale demonstration unit of this scheme is planned to be in operation early in the next decade. In summary, it appears that the nuclear generation of electric power for the remainder of this decade will be predominantly by the use of LWR's fueled with uranium dioxide and that this concept will constitute 90-95% of the industry throughout this period.

Numerous estimates of the size of the nuclear electric generation industry have been made and have required

frequent revisions as a result of changing conditions and schedules. A consensus of these estimates indicate that approximately 140-150,000 MWe may be installed and on line by the year 1980. Based upon this projection, the requirements of the nuclear fuel cycle to service the power generation industry have been estimated and are shown in Table O-2.

TABLE O-2

PROJECTED

NUCLEAR FUEL CYCLE INDUSTRY

1980

Type of Plant	Plant Size Thousands of MT	Annual Requirement Thousands of MT	No. of Average Plants Required to Meet Power Demands
Uranium Mines — Ore	250-750	17,000	30-40
Uranium Mills — U	0.5-1.1	34	40-50
UF_6 Production — U	5-15	34*	3 Low Enriched Plants & 3-4 Natural Plants
Isotopic Enrichment — SWU	7.5	20	3
Fuel Fabrication — U	0.3-1.8	5.3	8-10
Fuel Reprocessing — U	0.3-1.5	3	3-4

*Including recycle of recovered U from reprocessing operations

Nuclear Power Generation Basis: 140-150,000 MWe

Uranium Mining

1972

Domestic uranium mines presently produce about 6.3 million MT of ore per year having an average assay of about 0.2% U_3O_8. These mines have a total rate capacity of about 8.2 million MT per year. About 70% of the ore is mined in New Mexico and Wyoming with an additional 17% mined in Colorado and Utah. Thus, only about 70% of the ore produced is required to meet the demands of today's nuclear power industry.

Over 98% of the uranium produced results from open pit and underground mining. About one-half of the total ore is produced in 29 open pit mines with individual capacities up to 700,000 MT per year and 193 underground mines with individual capacities up to 230,000 MT per year produce most of the remainder. The environmental considerations for an open pit mine producing 480,000 MT per year are listed in Table O-3.

1980

By the end of the decade, the nuclear electric generation industry will require the mining of about 17 million MT of uranium ore annually. The bulk of the known uranium reserves are in New Mexico, Wyoming, Texas, Colorado, and Utah. It is expected that mining methods will be similar to those used today except that a larger percentage of the ore may be mined using underground mining techniques since a large percentage of the known reserves occur at depths greater than 400 feet. The environmental effect of the uranium mining industry at the end of the decade may be represented by 30-40 mines similar to that shown in Table O-3. However, the average amount of land use per mine is

expected to decrease as the percentage of ore mined by underground methods increases.

TABLE O-3

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR OPEN PIT URANIUM MINE — 4.8 x 10^5 MT/YR

Natural Resource Use	
Land (acres)	
Temporarily committed	290
Permanently committed	10
Overburden moved (MT x 10^{-6})	14
Water (gallons x 10^{-6})	
Discharged to ground	650
Fossil Fuel	
Electrical Energy (MW-hr. x 10^{-3})	1.3
Equivalent coal (MT x 10^{-3})	0.5
Effluents	
Chemicals (MT)	
Gases	
SO_x	19
NO_x	5
Hydrocarbons	0.05
CO	0.1

Uranium Milling

1972

At the present time, there are approximately 20 mills operational in the United States with a combined capacity of about 17,000 MT of U_3O_8 annually. Of these plants, 70% are within the output range of 500-1100 MT/yr. of U_3O_8. From Table O-1 it is indicated that today's nuclear power industry requires only 9,000 MT per year. Thus, it is apparent that approximately one-half of the 20 operational uranium mills would be adequate for today's power generation industry. These mills are located in sparsely populated areas in close proximity to mining operations principally in the States of New Mexico, Wyoming, Colorado, and Utah. The environmental considerations from a 1000 MT/yr. U_3O_8 uranium milling industry may be characterized by 20 mills each having environmental effects similar to those noted in Table O-4.

1980

The nuclear electric generation industry by the end of this decade will require the operation of about 40-45 uranium mills. It is estimated that these facilities will employ technology very similar to that for today's plants with minor technological improvements which will tend to minimize some of the environmental considerations. Since the bulk of the known uranium reserves are centered in the far western States of New Mexico, Wyoming, Colorado, and Utah, it is expected that new milling facilities will be located in those areas near companion mining operations and in sparsely populated relatively arid regions. Thus, the uranium milling industry at the end of the present decade may be represented by 40-45 operating units, each having effects on the environment as listed in Table O-4.

TABLE O-4

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS
URANIUM MILL — 1000 MT/Yr. U_3O_8

Natural Resource Use	
Land (acres)	
Temorarily committed	50
Permanently committed (limited use)	250
Water (gallons/yr. x 10^{-6})	
Discharged to air	3600
Fossil Fuel	
Electric Energy (MW-hr/yr. x 10^{-3})	15
Equivalent Coal (MT/yr. x 10^{-3})	3
Natural gas (scf/yr. x 10^{-6})	380
Effluents	
Chemical (MT/yr.)	
Gases	
SO_x	200
NO_x (40% from natural gas use for process heat)	87
Hydrocarbons	5
CO	1.7
Liquids (x 10^{-3})	
Tailing Solutions	1300
Solids (x 10^{-3})	
Tailings	500
Radiological (curies/yr.)	
Gases (including airborne particulates)	
Rn-222	460
Ra-226	0.1
Th-230	0.1
U-natural	0.2
Liquids	
U & daughters	11
Solids	
U & daughters	6700
Thermal (Btu/yr. x 10^{-9})	390

UF_6 Production

1972

The nuclear generation industry currently requires about 8,000 MT of uranium as uranium hexafluoride (UF_6). The two facilities in operation at the present time have capacity considerably in excess of this level. It is probable that either existing plant could meet this demand without difficulty. Thus, to meet present day requirements, essentially only one UF_6 production plant is required. The environmental considerations for a 5000 MTU/yr. UF_6 production plant are summarized in Table O-5.

1980

Plans are under way at the present time to initiate the recycle of uranium recovered from the fuel reprocessing step. It appears that each of the fuel reprocessing facilities may have a UF_6 production capability for recycle of recovered uranium values before the end of the decade. The requirements for UF_6 by the end of this decade are estimated to be approximately 34,000 MTU as UF_6. It is estimated that this requirement could be made up from the combined capacities of the planned UF_6 production facilities at the reprocessing plants amounting to 2700 MTU and facilities for production of UF_6 from natural uranium. This expanded demand could be met by the expansion of existing plants to double or triple their present capacity and additional new plants could be added so that a total of 3-4 facilities for the production of natural UF_6 could be operational by the end of the decade. At this time, no significant technological advances can be projected that will affect environmental considerations from these plants. Accordingly, it is projected that UF_6 production plants in 1980 will resemble in most respects the plants of today's era but may be about double their size. Therefore, the industry can be represented by a combination of about 3-4 natural uranium hexafluoride plants, each twice the size of the unit summarized in Table O-5 and three smaller plants handling recovered slightly enriched uranium.

TABLE O-5

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS URANIUM HEXAFLUORIDE PRODUCTION PLANT — 5000 MTU/Yr.

Natural Resource Use	
Land (acres)	
Temporarily committed	1400
Permanently committed	10
Water (gallons/yr. x 10^{-6})	
Discharged to air	100
Discharged to water bodies	1100
Total	1200
Fossil Fuel	
Electrical Energy (MW-hr/yr. x 10^{-3})	58
Equivalent Coal (MT/yr. x 10^{-3})	21
Natural Gas (scf/yr. x 10^{-6})	850
Effluents	
Chemical (MT/yr.)	
Gases	
SO_x	800
NO_x (25% from natural gas for process heat)	280
Hydrocarbons	2.2
CO	5.5
F	3.0
Solids	1000
Radiological (curies/yr.)	
Gases	
Uranium	0.4
Liquids	
Ra-226	0.7
Th-230	7.4
Uranium	0.7
Solids (buried)	
Other high level	7.7
Thermal (Btu/yr. x 10^{-9})	830

Isotopic Enrichment

1972

The nuclear generation industry at the present time requires about 5,000 MT of SWU to satisfy its present enrichment requirements. Today's industry is supplied with enrichment services from the complex of the three AEC owned and contractor operated gaseous diffusion plants. Essentially any one of the existing plants operated independently would be adequate to meet this demand. However, since all three installations are operated in a combined fashion, it is difficult to isolate the environmental considerations of an individual plant. Accordingly, the environmental effects of the total three-unit complex as it is operating today are summarized in Table O-6.

TABLE O-6

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR URANIUM ENRICHMENT COMPLEX

Natural Resource Use	1972 10.5 MT SWU	1980 18 MT SWU
Land (acres)		
Temporarily committed	1500	1500
Permanently committed	nil	nil
Water (gallons/yr. x 10^{-6})		
Discharged to air	8100	12,000
Discharged to water bodies•	10^6	1.8×10^6•••
Fossil Fuel		
Electrical Energy (MW-hr/yr. x 10^{-3})	28,500	41,000
Equivalent Coal (MT x 10^{-3})	10,000	10,000•••
Effluents		
Chemical (MT/yr.)		
Gases		
SO_x	400,000	400,000
NO_x	100,000	100,000
Hydrocarbons	1000	1000
CO	2500	2500
Particulates	100,000	100,000
F	45	45
Liquids		
Ca^+	490	880
Cl	740	1130
Na^+	740	1130
$SO_4^=$	490	880
Fe	36	65
NO^3	240	450
Radiological (curies/yr.)		
Gases		
Uranium	0.2	0.3
Liquids		
Uranium	1.8	3.1
Thermal (Btu/yr. x 10^{-9})••	290,000	420,000

•power plant cooling

••67% at power plants

•••about ⅓ of electrical power from nuclear stations in 1980.

1980

It is planned to increase the capability of the existing three-plant complex from about 10,000 MT SWU to 22-27,000 MT SWU. This increased capability will be achieved without the construction of major new gaseous diffusion facilities and will be accomplished primarily by improving and upgrading present units. The modifications will involve installation of improved equipment and increased utilization of electrical power. Thus, no new processing plants are required to meet the projected 1980 industry demands and accordingly the land requirement for this portion of the fuel cycle will remain essentially constant to the end of the decade. It should be noted that the utilities providing power to the gaseous diffusion complex have made commitments for the installation of significant amounts of additional power generation capacity. Included in these commitments are major nuclear generation stations amounting to 8-10,000 MWe of capacity. It is estimated that this switch over from essentially all coal burning power plants to some nuclear powered stations could effectively result in about one-third of the power requirements for the gaseous diffusion complex being provided by nuclear generation facilities. The industry demand in 1980 will require operation of the gaseous diffusion complex at a level of 20,000 MT SWU. Assuming that the plants will be modified to incorporate current improved technology, this level of operation will require approximately 4,700 MW of electrical power. On the basis that two-thirds of the power for this operation could be provided by coal burning power stations, the amount of power supplied by coal fired stations in 1980 will amount to 3,200 MW which is about constant with today's situation. Thus, despite the fact that the separative work capability of the complex will be increased by about 70% and its power

rating will be upgraded by about 50%, the major gaseous chemical effluents, which come from the combustion of coal, attributable to the isotopic enrichment function may remain constant with today's levels. The use of natural resources such as water (assuming once through cooling at the power plants) and liquid chemical and all radiological effluents might be expected to increase at a rate essentially equivalent to the increased separative work capability. A summary of the environmental considerations of the enrichment complex in 1980 is listed in Table O-6.

Fuel Fabrication

1972

The fuel requirements for the nuclear generation industry are approximately 1200 MTU. This capacity is met by 10 existing plants, a number of which have limited capacity and which conduct only a portion of the processes required to produce fuel assemblies for reactors. In fact, only two of the facilities that are in operation at the present time are large scale production plants which have capacities similar to that considered for the model plant in this statement. The environmental considerations for a 900 MTU fuel fabrication plant are summarized in Table O-7.

TABLE O-7

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR 900 MTU/Yr. FUEL FABRICATION PLANT

Natural Resource Use	
Land (acres)	
Temporarily committed	100
Permanently committed	nil
Water (gallons x 10^{-6})	
Discharged to water	135
Fossil Fuel	
Electrical Energy (MW-hr. x 10^{-3})	44
Equivalent Coal (MT x 10^{-3})	16
Natural Gas (scf x 10^{-6})	94
Effluents	
Chemical (MT)	
Gases	
SO_x	600
NO_x	160
Hydrocarbons	1.6
CO	4
F	0.1
Liquids	
N as NH_3	220
N as NO_3	140
F	10
Solids	
CaF_2	680
Radiological (curies)	
Gases	
Uranium	0.005
Liquids	
Uranium	0.5
Th-234	0.3
Solids (buried)	
Uranium	0.2
Thermal (Btu x 10^{-9})	230

1980

Plans are under development for the expansion of the present production facilities and for the design and construction of numerous new production type fuel fabrication facilities to replace some of the smaller units now in operation. It is estimated that by the end of the decade, 8-10 production facilities could be in operation to meet the annual requirements of over 5,000 MTU of fuel per year. In the case of fuel fabrication, technological advances have been under development for several years which could have a significant effect on environmental effects. The development of the technology for the dry conversion of UF_6 to UO_2 has been in progress for some time and it is anticipated that this technique will be reduced to practice by the end of the decade with a substantial reduction of both gaseous and liquid chemical effluents that are associated with process operations. This process improvement will essentially eliminate the chemical effluents of ammonia and fluoride. Thus, this industry can be characterized in 1980 by 8-10 plants similar to the one summarized in Table O-7 with the elimination of most of the process chemical effluents.

Fuel Reprocessing

1972

One plant for the reprocessing of commercial nuclear power reactor fuel has been in operation for about six years. This plant is currently shut down for extensive modifications and has operated for only a portion of 1972. A second plant is nearing the operational stage and is planned to be handling irradiated fuel during 1973. An additional plant is under construction and there are plans for its operation by the middle of the decade. At the present time there is little demand for reprocessing services

as noted in Table O-1 and much of that demand has been met by the one plant operating for part of a year and the ability to store fuel at that plant is planned to be operational in 1973. The environmental effects of a 900 MTU/yr. reprocessing plant are shown in Table O-8.

1980

It is estimated that three fuel reprocessing plants may be operational before the end of the decade with a combined capability of processing 2,700 MTU annually. A fourth plant is being planned for start-up late in this decade or early in the 1980's. It appears that these plants could be adequate to meet the power industry needs. Thus, the industry in 1980 can be characterized by 3-4 plants similar to the plant outlined in Table O-8.

TABLE O-8

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS OF 900 MTU/YR FUEL REPROCESSING PLANT

Natural Resource Use	
Land (acres)	
Temporarily committed	2000
Permanently committed	100
Water (gallons x 10^{-6})	
Discharged to air	100
Discharged to water	150
Fossil Fuel	
Electrical Energy (MW-hr. x 10^{-3})	12
Equivalent Coal (MT x 10^{-3})	4
Effluents	
Chemical (MT)	
Gases	
SO_x	160
NO_x	185
Hydrocarbons	0.5
CO	1
F	14
Liquids	
Na^+	140
Cl^-	0.5
$SO_4^=$	14
NO_3 (as N)	5
Radiological (curies)	
Gases (including entrainment)	
Tritium (x 10^{-3})	405
Kr-85 (x 10^{-3})	9000
I-129	6 x 10^{-2}
I-131	6 x 10^{-1}
Fission products	26
Transuranics	1 x 10
Liquids	
Tritium (x 10^{-3})	65
Ru-106	100
Thermal (Btu x 10^{-9})	1600

Waste Management

1972

At the present time, there are six commercial land burial sites in operation in the United States. The total area of these sites is approximately 600 acres. Not all of this land is available for actual burial of wastes since some of the land area is needed for support facilities, pre-burial storage, etc. The land available for burial of wastes is adequate for the current generation of radioactive waste by fuel cycle industries. The current requirement for the waste generated in the fuel cycle is about 1.0-1.5 acres annually. At the present time, there is no requirement for a Federal storage facility for long-term storage of solidified high-level wastes generated as a result of fuel reprocessing operations.

1980

By 1980, it is estimated that the nuclear electric generation capacity will increase to about 12 times present capacity. On this basis, about 12 to 18 acres will be needed for burial of radioactive waste generated by fuel cycle facilities. This would be well within the capacity of the currently existing commercial land burial sites and it does not appear that additional sites would be required. By 1980, it is anticipated that a Federal storage facility will be under construction for storage of solidified high-level wastes. The high-level wastes, in a combination of liquid and solid forms, could be stored at the fuel reprocessing facilities without significant environmental effects until the Federal repository is completed and available for storage of wastes during the next decade.

Transportation

1972

The nuclear power generation industry is still small and amounts to 10-12 annual operating units. The transportation needs of the supporting fuel cycle are shown in Table O-9. The movement of low specific activity material constitutes almost all of these shipments. The heat and weight in any shipment and the relatively small number of shipments will essentially have no appreciable effect on the environment. The estimated population exposure for onlookers, people along the route and transportation workers is 2.8 man-rem.

1980

By the end of the decade the size of individual plants may increase and certainly the number of plants will greatly increase. As production levels increase at a particular site, the transportation requirements may favor switching from the truck to the rail mode of movement.

Typical of this change might be the shipment of natural UF_6 in cylinders from the UF_6 production plant to the gaseous diffusion plant. Despite the fact that the mass handled in transportation should increase by a factor of about 12-15, the quantities involved will continue to be of little consequence with regard to the total transportation industry. A summary of the shipments is shown in Table O-9. The estimated population exposure is 35 man-rem. It is assumed that this 35 man-rem exposure will be distributed among at least 600,000 people giving an average exposure of 0.06 mrem/person/year. The dose due to the average natural background radiation is about 130 mrem/person/year.

TABLE O-9

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR TOTAL NUMBER OF PACKAGES TRANSPORTED ANNUALLY

Step-Material Transported	1972 Total No. of Truck Shipments	1980 Total No. of Truck Shipments
1. Mine to Mill — Ore	40,000	500,000*
2. Mill to UF_6 Production — U_3O_8	140	1,800**
3. UF_6 Production to Enrichment — Natural UF_6	260	3,300**
4. Enrichment to UO_2 Plant — Enriched UF_6	60	750**
5. UO_2 Plant to Fabrication — Enriched UO_2	180	1,400**
6. Solid Wastes to Federal Storage — Fission Products	12(Rail)***	150(Rail)***

*Almost all of these shipments are made on privately owned land.

**Number of shipments may be reduced by shipments from larger processes being switched from truck to larger rail shipments.

***These packages, one (1) per shipment, will be stored at the reprocessing site until after 1980 when the Federal storage and repository facilities are planned for use.

STATE OF NEW YORK

COMMENTS
on the
"Environmental Survey of the Nuclear Fuel Cycle"
by the
U. S. Atomic Energy Commission,
Fuels and Materials, Directorate of Licensing
Issued November 1972

1. General Comment — It is suggested that the "Survey" provide a complete evaluation of the environmental costs of the nuclear fuel cycle. To do this, the "Survey" should include environmental costs of shipment of fuel to the power plant and spent fuel and other radioactive wastes from the power plant and the environmental costs of the operation of a 1,000 MW plant. This supplemental information could be presented in an appendix to the "Survey." The information presented in this proposed appendix should include, on an annual basis, the environmental considerations of those portions of the nuclear fuel cycle for the "model light water reactor" that are controlled directly by the applicant and subsequent owner of a nuclear power plant. The delineation of responsibilities would afford greater assurance that each facet of the fuel cycle is given due consideration by industry, the utilities and government.

It should be made clear, if this is done, that each environmental report by the applicant must include the needed detail for this portion of the nuclear fuel cycle that will have a direct impact on the environment around the proposed site.

For example: The survey provides little information on the numbers and types of irradiated fuel and high level radioactive waste shipments to various known fuel reprocessing plants and waste disposal areas. It is suggested that the projected amount and type of each material planned to be shipped by either rail or truck be stated in the Survey for each A.E.C. Compliance Region. Such information would be helpful to state government agencies responsible for regulating the transportation of hazardous commodities.

2. General Comment — It would be desirable to have an environmental survey for fossil fuel cycles to allow a comparison of the total environmental costs of a nuclear power plant and a fossil fired power plant.

3. General Comment — In regard to many of the tables in the report, the use of a negative sign for exponents of 10 is confusing. It is recommended that the exponential be included in the unit rather than as a multiplier of the unit. For example, in Table S-3, Page S-14, under Land: Overburden moved (MT x 10^{-6}) — 2.7; instead use; Overburden moved (MT) — 2.7 x 10^{6}.

4. Page S-3 Fig. S-1 — Reprocessing should show an output to plutonium storage which is described on page F17.

5. Pages S-11 and S-12 — The "Survey" identifies the most commonly used standards that were the basis for evaluating the environmental impact of the effluents. A brief discussion should be included on FRC recommendations such as the "as low as practicable" concept. In addition, the "Survey" should refer to the radiological standards in the "Greenbook" ("Water Quality Criteria". F.W.P.C.A., April 1, 1968) that is used in the "Survey" as the standard for chemical wastes.

6. Page S-16 Table S-3 — Liquid effluents — Sr-90, Cs-137 and I-129 are omitted — these isotopes have been released in liquid effluents from NFS.

Solids from manufacturing and reprocessing will be sent to commercial burial sites and should be included in the table.

7. Page S-30 — Gaseous releases refer to minute quantities of radioiodine. The Survey should specifically consider I-129 and provide quantitative information rather than the general wording "minute." The reconcentration of I-129 in milk as measured around the NFS facility should be described.

In addition, the potential for exposure of the population as a result of gaseous releases of tritium and its introduction via air transport into surface public water supplies should be considered.

8. Page S-31 — In referring to measured 1971 offsite concentrations of liquid releases, Sr-90 and Cs-137 and other isotopes should be included. The dilution factor of the receiving streams should be provided and the concentration in the effluent from the plant should be included.

9. On pages S-33, and F-14, the report indicates that the fuel element hulls and other contaminated fuel element parts will be buried on site at the reprocessing facility in retrievable form and may eventually be shipped to Federal storage facility. The report should discuss minimum requirements and present practices by the industry in terms of retrievability of hulls.

10. On page F-4 under Effluents, it is assumed that all of the Kr-85 and tritium produced in the nuclear power plant

fuel is released during the fuel reprocessing step. Estimated annual whole body exposure at the site boundary from gaseous effluents is less than 1% of the natural background. The release of radioiodine could result in an estimated maximum dose to the thyroid which is approximately 1% of the guide line limits recommended by the International Commission on Radiological Protection. This assumption and estimate apparently is based on the statement on page F-13 which indicates that gaseous effluents will be discharged to the atmosphere thru off-gas treatment and filtering systems which are designed to remove over 99.9% of the radioactive iodine gas. There should be clarification as to whether the 99.9% removal factor will be a requirement of the United States Atomic Energy Commission.

11. Page F-6 — Regarding discharge to the watershed from the one plant, there is no reference to radionuclides such as Sr-90, Cs-137, and I-129 nor is there an adequate discussion of the dilution factor in the onsite streams that was required to bring the offsite concentration of H-3 to 4% of 10CFR20. Moreover, there was no discussion of the plant load factor during 1971 to permit evaluation of potential concentrates at predicted full load operation.

12. Page F-14 Table F-3 — As previously noted, liquid releases do not include Sr-90, Cs-137, and I-129.

13. Page F-15 — It is stated that within five years all high level liquids will be converted to solids. Section F of the "Survey" should address the impact of the solidification process upon public health and the environment. For example, the more volatile fission gaseous products (Ru-106, I-129, etc.) might be released during any of the candidate solidification processes. Since NFS was operational at

the time that 10CFR50, Appendix F was enacted, the wastes will be stored in liquid form at NFS for more than five years. This point should be clarified with an estimated schedule for converting the existing high level wastes at NFS to a solid form.

14. On page F-23 and F-24 under Gaseous releases the estimated activity to be released annually by the model plant is summarized in Table F-5. Clarification is needed as to whether there will be any significant difference between estimated releases and actual releases.

15. Page F-26 — In describing the liquid wastes from NFS, it is noted that the 10CFR20 MPC's are exceeded at the point of release. The average concentrations or the factors by which the MPC's are exceeded at point of release should be included and as previously recommended other radionuclides such as Sr-90, Cs-137, and I-129 should be included.

16. Page F-26 — The Survey states that receiving stream measurements of H-3 and Ru-100 were less than 4% of the limits in 10 CFR 20. This should be clarified as Buttermilk Creek concentrations did exceed 4%. The reference apparently refers to the maximum concentration offsite after [extended] dilution of Buttermilk Creek in Cattaraugus Creek. The statement implies there are no other isotopes released and this should be corrected. DEC's environmental monitoring program detected Ru 106 at 1% of 10 CFR 20 in one daily sample from Cattaraugus Creek and at 8.4% of 10 CFR 20 in one weekly composite sample in 1971. In May 1971 the Sr-90 in a weekly composite sample was 45% of 10 CFR 20 limits.

17. Page F-26 — The statement is made that the stream (Cattaraugus Creek) receiving Nuclear Fuel Service Liquid

waste is not a potential source of drinking water and that there is little potential for radiological effects to human beings from this liquid effluent stream. There is no basis provided in the "Survey" for this conclusion. Moreover, Cattaraugus Creek discharges to Lake Erie. There are a number of public water supplies on the New York side of Lake Erie which could be affected by discharges. Furthermore, Cattaraugus Creek should not be eliminated as a potential source of drinking water. However, on the basis of keeping exposure to radiation as low as practicable, alternate sources of comparable or better quality than Cattaraugus Creek that do not receive the liquid effluents from NFS would be preferred sources for public water supplies.

18. Page G-1 — It should be noted that Appendix F did not require NFS to convert high level liquid waste stored for five years to solid form.

19. On page G-2, the second paragraph indicates that radioactive wastes other than high level are buried in shallow trenches in the containers in which they are shipped and there is no intent to recover the wastes once they are buried. Also on page G-4, it indicates that wastes other than high level as defined in Appendix F-10 CFR-50 regardless of its source may be sent to a land burial site for disposal. The basis for this statement is not clear and does not appear to be consistent with the United States Atomic Energy Commission policy as referred to in Manual Item 0511 dated March 20, 1970 in which it is required that United States Atomic Energy Commission contractors segregate certain wastes.

20. Page G-4 — The burial of all wastes other than high level as defined by Appendix F in non-recoverable form at commercial burial sites is under review by at least two task

forces at this time and it is anticipated that a more restrictive criteria will be developed.

21. Page G-5 — At least one site, NFS, does not have monitoring wells.

22. Page G-12 — The description of a model land burial facility does not reflect some of the operating problems. The trenches at the NFS site all have water in contact with the wastes as a result of accumulation of rainwater in the trenches.

23. Page G-16 — In discussing land use, there is a statement that there will be only a few curies in wastes other than high level for an annual fuel requirement. The resins shipped from operating nuclear power plants are apparently not included in this estimate. The solid wastes from NFS including those from the low level waste treatment plant would have a significant quantity of radioactivity that should be included in the estimated number of curies. This information should be included in the proposed appendix to the "Survey" (see Comment #1).

24. Page H-21 — The traffic aspects refer to 48 shipments on public highway and states that there should be no need for overweight permits. Any spent fuel shipment by truck will require an overweight permit and the number of shipments of spent fuel will likely be in the range of 100 truck shipments. This emphasizes the desirability of including all portions of the fuel cycle in this Survey. This information should be included in the proposed appendix to the "Survey" (see Comment #1).

25. Page S-48 — The summary of waste management makes no reference to the USAEC's practice at their oper-

ational facilities of segregating wastes with alpha contamination and prohibiting these contaminated wastes from non-retrievable shallow land burial such as used at commercial burial sites.

26. Page F-3 Table F-1 — As noted in comments on summary table, Sr-90, Cs-137, and I-129 should be included in the liquid effluents.

27. Page F-5 — In discussion of radioiodine it is not clear whether the predicted maximum dose is based on I-129 or I-131 or a combination of all radioiodines.

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

[1]

IN THE MATTER OF

URANIUM FUEL CYCLE

Docket No. RM-50-3

New Executive Office Building
Room 2010
Washington, D.C.

Wednesday, 17 January 1973

The above-entitled matter came on for prehearing, pursuant to notice at 10 a.m.

BEFORE:

M. D. PAGLIN, Esq., Chairman.
DR. JOHN C. GEYER, Member.
DR. M. J. STEINDLER, Member.

APPEARANCES:

JOHN K. RESTRICK, 175 Curtner Avenue, San Jose, California, on behalf of General Electric Company.

GORDON BURLEY, 5600 Fishers Lane, Rockville, Maryland, on behalf of the Environmental Protection Agency.

RONALD LEE, Rockville, Maryland, on behalf of Nuclear Fuel Services, Inc.

MARVIN UPTON, Isham, Lincoln & Beale, Chicago, Illinois, on behalf of Commonwealth Edison Company.

GEORGE GLEASON, New York, New York, on behalf of Atomic Industrial Forum, Inc.

[1-A]

GEORGE EDGAR, 1140 Connecticut Avenue, N.W., Washington, D.C., on behalf of Babcock & Wilcox and Nuclear Materials and Equipment Corporation.

ANTHONY Z. ROISMAN, 1712 N Street, N.W., Washington, D.C., on behalf of Consolidated National Intervenors and Union of Concerned Scientists.

PETER A. LINDLEY, P. O. Box 355, Pittsburgh, Pennsylvania, on behalf of Westinghouse Electric Corporation.

ROY NELSON, on behalf of Jersey Nuclear Company, Inc., (Exxon Nuclear Company, Inc.)

GEORGE C. FREEMAN, JR., DAVID BROLLIER, and CLAUDIA COPELAND, Hunton, Williams Gay & Gibson, 700 East Main Street, Richmond, Virginia, on behalf of Baltimore Gas and Electric Company, Boston Edison Company, Consumers Power Company, General Public Utilities Corporation, Long Island Lighting Company, New England Power Service Company, Northeast Utilities Service Company, Pacific Gas & Electric Company, Philadelphia Electric Company, Public Service Company of New Hampshire, Public Service Electric & Gas Company, San Diego Gas & Electric Company, Southern California Edison Company, Virginia Electric & Power Company, and Yankee Atomic Electric Company.

LEONARD GELLER, New York, New York, on behalf of the S. M. Stoller Corporation.

[2]

PROCEEDINGS

CHAIRMAN PAGLIN: Good morning, ladies and gentlemen. Can you — are these mikes working? Can you hear me?

I am Max Paglin and to my right is Dr. Steindler of the Argonne National Labs; and to my left is Dr. Geyer, from Johns Hopkins. We constitute the Board which the Atomic Energy Commission has appointed for this rulemaking hearing in the nuclear fuel cycle.

The purpose of this procedure planning session is as has been authorized by the Commission's supplemental notice in December of '72 to assist the Commission in carrying out one of the objectives of this legislative type hearing and that is to conduct it as expeditiously as possible.

Our objective this morning will be of a procedural nature. We would like, with the cooperation of those people and representatives present, to note the appearances, to attempt to set up dates and times to be allowed for oral presentations to the extent the parties wish to make them on February 1st, and to allow those participants who file notices and requests to participate in the February 1st hearing.

What we also intend to do this morning is to discuss the procedures which will govern the February 1st hearing.

Now the supplemental notice of December 27, and I assume that all of you have gotten copies, will actually be the document which will govern the procedures albeit the [3] Commission indicated there is to be flexibility, that there is to be informality, and that it is to be in the nature of a legislative type hearing. I will supplement it by saying the kind of hearing a contressional committee conducts when it is on a fact-finding inquiry.

The participants have been served, as I understand, with the supplemental notice by the Secretary.

Now there were in some of the preliminary letters sent to the Secretary a number of questions as to procedure, and I believe that probably most of them were answered by the supplementary notice. In fact, I believe that there was a crossing in the mail. I trust that some of the questions that were asked, for example as to whether or not the witnesses would be permitted to be accompanied by counsel, whether or not cross-examination would be allowed, et cetera, these were answered in great part by the supplemental notice to the extent they weren't, it is the purpose of this session to try to set up some effective and reasonable procedures for the conduct of that proceeding.

Now the proceedings will be recorded and a transcript will be made. It is contemplated that the Regulatory Staff will open the proceedings with a prepared statement and then supplemented by oral presentations and I understand that when we call on the Regulatory Staff — but my understanding is now there will be two witnesses for the [4] Regulatory Staff. We are also — it's also been indicated that to the extent feasible, these statements will be distributed in advance. I would hope enough time will be available so that they can be mailed out to the participants and they will have them sometime before the February 1st session.

Now as far as those participants who desire to present additional written submissions, that is in addition to those that have been required by the Commission's notice to be filed by January 15th, the Board would like to have those written statements filed with it at least 48 hours in advance of the February 1st hearing so that the Board may have an opportunity to review them for purposes of questioning.

As you know, and I refer to it in some more detail later on, questioning will be conducted only by the Board members. Therefore, it seems to us to be the most useful pro-

cedure to get these written — additional written submissions to us some 48 hours in advance of the February 1st hearing.

We would also like for sufficient copies to be brought to the opening of the hearing on February 1st for distribution to the other participants at the hearing.

Finally, we have been requested by the Secretary's office to direct that 10 extra copies, in addition to those I have mentioned, be furnished and filed with the Secretary for the necessary docketed files.

[5]

Next, those who desire to make oral presentations, either as by way of summary of the written presentations or by way of comment on the other written submissions, should, if possible, file with the Board in advance, and when I say in advance, I mean reasonably, depending on the circumstances, a brief outline of the major areas which you propose to cover. Again, keep in mind it is the view of the Board that this will help expedite this proceeding, it will assist the Board in, shall I say getting a handle on what is being brought into the record.

Also, as you know, as the supplemental notice indicates, the participants will have the opportunity to file supplementary written statements as they may deem necessary and appropriate in light of the hearing record that will be made on those days. Those statements can be filed during the period of 30 days after the oral portion of the hearing has been completed. I mention the fact that the Commission has indicated, with respect to the procedures which will be followed in this rulemaking informal hearing, of a legislative type, that no cross-examination will be permitted by the participants of witnesses appearing, no discovery was mentioned; however, the participants appearing will be subject to questioning by the members of the Board.

[6]

Now there were some questions raised in the correspondence from some of the participants whether or not the participants could propound questions to those appearing as witnesses, through the Board.

It is the feeling of the Board that in keeping with the intent of the supplemental notice of the Commission, as to the nature of this proceeding, that it would not be appropriate for the Board to accept questions from the participants to be propounded to other participants.

It is our feeling that, in keeping with the intended nature of this proceeding to the extent that participants wish to raise questions regarding the positions taken by others on the survey or the proposals as to the amended rules, that they may do so in their oral presentations to the extent they have had advance notice of these positions, for example, the statements that have already been filed; or they may use the opportunity which has been given to them by the Commission, of the supplemental written submissions to highlight and point up the problems, and the questions which they feel are raised in the written and oral presentations of the other participants.

This would obviously be for the benefit of the Board, and for the Commission to whom, as you know, under the notice, this entire record will be certified in accordance with the procedural regulations specified by the Commission.

Now then, this is by way of preliminary as to the [7] proceedings which we will follow in the February Board hearings.

Now, what I have done is, I have taken the liberty of preparing a rather informal list of the participants who have already filed, indicating statements and/or oral — opportunity to make oral presentations.

I have, I hope, sufficient copies of those lists and, Ms. Janinek, would you be good enough to have them distributed to the people here?

It will give you an idea of who has filed and who is to be contacted in the event you need information from them.

That list is as up to date as we have been able to get it, as of yesterday afternoon. I am presuming that January 15th, having passed that, that being the date the commission specified, everyone is in.

I will refer, later, to the two requests for extensions of time.

What I would propose to do now, is to call upon those — the participants present today, and ask them to note their appearances, and on whose behalf they are appearing. I trust the group will bear with us, as we go down the line. It is for the record we are making.

I would like, also, for the participants when they rise, and give their names and on whose behalf they are appearing, to let us know whether or not they wish to make an [8] oral presentation on February 1, in addition to the statements and, if so, what areas will be dealt with, and how much time, approximately, they will require.

In this connection, I would like to make specific reference to the fact that the Commission's notice, referring as it did, to the privilege or opportunity for oral presentations, sais specifically, that depending upon the time available, the participants may be permitted to make brief oral statements, either in addtion to, or in lieu of written submissions.

I ask you to keep that in mind in giving us your statements. We do not have an unlimited amount of time and again, keeping in mind the nature of the proceeding, we want to get an estimate of how much time you think you

will need, and on the basis of these estimates, the Board will make out lists of time.

I would hope, further, that in the interests of expediting this portion of theproceeding, we would like to encourage the participants to make joint presentations if their positions permit it, and concurrences in already expressed positions, supplemented, if they wish, by the addition of written submissions.

Our feeling is the opportunity given by the Commission to these supplemental written submissions is an opportunity which can be used in lieu of a lot of oral argument, **[9]** because you will have the opportunity then to see the record, to see the submissions, and you can make your response, rebuttal, however you will, in the form of these written submissions to be submitted 30-days after the close of the oral portion.

When we organized the schedule, we would hope, in the light of what you tell us today, to organize the presentations so that as meaningful and as logical a record can be made for the Commission's use in this proceeding.

Now, what I would like to do is call on the participants according to the list, and ask them to give us the information that I have indicated.

Remind me there are two other parties because of conflicts in other Commission proceedings unable to be here today, but they have indicated they would like to have time for oral presentations.

There is no particular order in which I am calling the persons, now. They happen to be the order in which the materials were filed with the Secretary, and in which the Secretary served on the participants.

There is no other criterion that I have used in making up this list, nothing to the contrary should be inferred.

Like, starting with General Electric. Their representative, I have here?

MR. RESTRICK: John Restrick, attorney for General **[10]** Electric Company.

We would plan to primarily file a written statement. We would like to have a brief oral statement, I would expect not more than fifteen to thirty minutes.

Exchanger areas.

We would, in the written statement, cover which alternatives we favor primarily and some comments on the environmental survey and the areas in which we participated which are primarily fabrication, and reprocessing, and possibly some transportation aspects.

CHAIRMAN PAGLIN: Thank you, very much.

If the reporter fails to get the spelling, please ask them.

Next, I have is Duquesne Light Company.

Are they here today?

(No response.)

I see some notes I made.

The next three, according to my notes from the information we got, from the parties will be submitting only written statements to my understanding.

That would be the next, Duquesne Light, Mississippi Power and Light Company, Gulf General Atomic Company.

If my information is correct, they will probably only be submitting written statement.

Next, I have on the list is Environmental Protection Agency.

[11]

MR. BURLEY: Gordon Burley. Office of Radiation programs, Environmental Protection Agency.

We intend to file a written statement probably supplemented by an oral summary and possibly some additions. Our representative at the hearing will be Mr. W. D. Rowe, the Deputy Assistant Administrator for Radiation Programs, and the subject will be, primarily, the alternative which we favor and the problems with the genral approach as presented in the Federal REgister notice.

CHAIRMAN PAGLIN: Thank you, Mr. Burley.

Next on the list, my notes indicate University of California, Professor Ruby has filed a statement. He will not be making an oral presentation.

Next, I have Nuclear Fuel Services, Rockville.

MR. LEE: Ronald Lee, Nuclear Fuel Services.

We will be participating in the preparation of the atomic industrial forms comments, and we will not submit either a written or an oral presentation, independently.

CHAIRMAN PAGLIN: Thank you, sir.

Minnesota Pollution Control Agency.

That is one of the notes that I have. Mr. Ken Dzugan has a conflict. He is in another AEC case. He has indicated he will be present at the February 1st, session, and has asked for about thirty minutes. I did not get from him the areas of his presentation. We will have to get that [12] supplement.

Sierra Club, Legal Defense Fund, Inc.

(No response.)

Again, if I recall, yes, Mr. Lash and Mr. Hoffman, John D. Hoffman. This was apparently — they have written to

the Secretary indicating, and I spoke to them on the phone, there was a delay in the mails, and they did not get the materials in time.

They have requested an extension of time, until January 25th to submit their written submission. It is yet undetermined as to whether or not they will want to appear.

Considering the circumstances, the Board is of a mind to grant this extension and unless there is serious objection from any other participants, we would advise them that they do have that extension, which they requested.

Do I hear any objection?

(No response.)

All right.

We will advise them they have an extension until January 25th for their comments.

Next, is Commonwealth Edison Company here?

MR. UPTON: I am Marvin Upton. I am representing Commonwealth Edison Company, here, today. Commonwealth Edison is one of eight organizations on behalf of which I filed written comments on Monday of this week. If the Chairman would [13] like me to, I may have others, if I can remember them.

Alabama Power Company, Consolidated Edison Company of New York, Inc., Hydro Mohawk Power Corporation, Power Authorities, State of New York; Omaha Public Power District; Rochester Gas and Electric Company; Georgia Power Company.

I might also say, Mr. Chairman, that I am also representing today, the Edison Electric Institute which will appear later, on your list. It is probably, most probably, that the

Edison Electric Institute will not take any position with respect to the various alternatives offered by the Commission.

However, the Institute has a continuing interest in the procedures that are to be followed in the course of this proceeding. I shall be representing them in that connection and in that connection, only.

CHAIRMAN PAGLIN: And you will not be making an oral presentation?

MR. UPTON: We don't expect to make an oral presentation.

Mr. Miller, who—of Isham, Lincoln & Beale of Commonwealth Edison, whos name you have listed there, did file a notice of intention to participate before the deadline on January 1, and reserved his right to participate fully.

I don't anticipate that Commonwealth Edison, or any of the other organizations, I have listed, will be submitting **[14]** oral statements.

Certainly, if any of them do, it will have to be reasonable notice to all the other parties involved if they plan to do so before the hearing commences.

CHAIRMAN PAGLIN: Fine.

MR. UPTON: However, I am sure that all the eight organizations I name, we do plan to file supplemental comments after the hearing record is concluded.

CHAIRMAN PAGLIN: Fine.

Thank you very much, Mr. Upton.

Mr. Gadler? Steve J. Gadler also informed us that he has a conflict. I think he is in the same proceeding as Mr. Dzugan. He will not be able to attend today.

He will want to make an oral presentation and will want approximately 30 minutes. He is an individual citizen, who has participated in a number of these proceedings in the Minnesota area. Again, I don't know the specific areas of his presentation.

Next on our list is Teknekron, Inc., of Washington.

Is their representative present?

(No response.)

All right. I have, next listed, the Atomic Industrial Forum, Inc., and that was Mr. Lee—I mean—who is the gentleman who appeared for Nuclear Fuel Services?

MR. LEE: Ronald Lee. I believe the Atomic **[15]** Industrial Forum is represented separately.

CHAIRMAN PAGLIN: I beg your pardon.

Sir, your name?

MR. GLEASON: I am George Gleason, counsel for the Atomic Industrial Forum. We would like an opportunity to make an oral statement. Our oral statement will be directed both to the substance of the environmental survey.

We have, through the forum, which represents many of the companies that are engaged in fuel cycle activities, we have put together a group which is in the process of reviewing the environmental survey and developing detailed comments on it.

I suspect that our comments with respect to the survey may be more detailed in nature than most of the other organizations that will be filing comments.

For that reason, and here, I would like to seek the guidance of the Board, I think that it might be useful in the course of our oral statement to give a fairly detailed

view of our appraisal of the environmental survey, since it may not otherwise be brought up in the oral presentations.

So, much of our oral statement would be directed to the environmental survey. We would also like to discuss the two alternative rules that are before the Board. We will not, I think, take a position in favor of Alternative One, or Two, because, as the Board is probably aware, there are [16] substantial differences of opinion with respect to the precise wording of those rules, and since we represent many organizations, we feel that we can not take a position in favor of one or two, but we do have some views we would like to express.

I would think that we could make our oral presentation in about 90 minutes.

[17]

CHAIRMAN PABLIN: May I use this opportunity, Mr. Gleason, to comment—and I welcome the comments of my—all the members of the Board. I would like to make reference back again to the Commission's notice. It seems to me that what should be kept central in the minds of the participants is not only the nature of the proceeding, but also whether or not the questions you want to raise, the problems you want to highlight cannot be covered adequately in your written statement; and here again, permit me, perhaps impertinently, to say I've alwaos governed myself—or at least I would like to have this governed by why can't it be covered in the written statement, number one; number two, what is there in the oral presentation that will add a measure or a dimension that is not covered in the written presentation?

We do not mean to be inflexible about it, I wish you to know that. But by the same token, I asked the participants to think of it in those terms. That is there in your

oral presentation that would assist the Board and the Commission in understanding the issues and perhaps highlighting them? I am saying oral presentations are very necessary, but the question is does one need to make an extensive oral presentation if, in fact, it is covered?

My own personal feelings are in these matters, it is like a brief. You file a brief; you use the opportunity for oral argument, perhaps to highlight it or to raise questions [18] to permit the tribunal to ask questions and you answer them, but not to repeat the substance of the brief, more than in a mere brief outline.

MR. GLEASON: I think we would be guided by your desires that we not repeat material that would be better presented in written form.

CHAIRMAN PAGLIN: Thank you.

As I indicated, the Board considers these as requests for time and we will try to be as reasonable in meeting the requests as circumstances will permit.

Let me digress by saying this is my first proceeding. I have already made my first faux pas and I want to get it behind me. I knew there was something about the order in which I was going to call upon the participants, but my gut didn't tell me what it was. I guess in my opening the proceedings and the nervousness. The faux pas consists of having failed to call upon the Regulatory Staff to open it.

(Laughter.)

CHAIRMAN PAGLIN: Now that I am down to the first page with profound and abject apologies, and I can assure you it won't happen on February 1, I would like to call on Mr. James Murray, representing the Staff, to let us know what the Staff's position would be.

MR. MURRAY: I wonder if it would be useful, Mr. Chairman, for me to sit here? I could talk to the microphone.

[19]

CHAIRMAN PAGLIN: So long as they can all hear.

MR. MURRAY: Mr. Chairman, we plan to make our presentations in two segments. First will be by Mr. S. H. Smiley, the duty director for fuels and materials, who, incidentally, is sitting directly to my left at this moment, who will present a sort of an overall picture of the environmental impact of the fuel cycle as we see it, based on the survey, the environmental survey of the fuel cycle, this yellow book prominently displayed before you gentlemen. Also I believe I tried to send it to everyone who has expressed an interest in these proceedings. We also tried to send, as we became aware of them, to those same persons, copies of all the references that aren't copyrighted, contained in that yellow document.

In addition, we have tried to send out some references specifically focused on the waste management area that Dr. Pitman, who will present the second portion of our presentation, will deal exclusively with.

We expect, Mr. Chairman, that these two statements together can be completed in approximately three-fourths of an hour. These will be the two primary lead witnesses we have with us. We also plan to have some 10 or 12 additional technical people on hand to respond to questions as they may arise.

I believe that completes what I was going to say.

[20]

CHAIRMAN PAGLIN: Thank you, Mr. Murray. It reminds you—your last statement reminds me of a question that was raised by one of the participants in an earlier letter prior to the supplemental notice raising the question

as to whether or not the participants will be permitted to bring with them other technical personnel who would be available as a resource for the Board or participants. I would think, yes, of course, we would welcome that because if I may be somewhat colloquial, the name of the game is to compile a record as complete and as meaningful as possible, so as to permit the Commission to reach an informed decision in the matter; and the more cooperation and the more information we get in that regard, I think the better the proceeding will turn out to be.

All right. Now, do I have your forgiveness, Mr. Murray?

MR. MURRAY: My wholehearted forgiveness.

(Laughter.)

CHAIRMAN PAGLIN: Thank you, sir.

I now turn to page 2. I have listed on page 2, No. 14, Babcock and Wilcox, Washington.

MR. EDGAR: I am George Edgar of the Washington firm. I represent both Babcock and Wilcox, and NMEC, Nuclear Materials and Equipment Corporation, in these proceedings. We have reviewed our respective positions, and upon further consideration, believe that it would be in the [21] interests of expedition to consolidate those positions. We contemplate making a written statement on behalf of Babcock and Wilcox and its wholly-owned subsidiary, NMEC, jointly.

In addition, we do not contemplate making an oral presentation at this time. We, therefore, believe that the NMEC petition can be considered withdrawn and Babcock and Wilcox will appear as one entity.

CHAIRMAN PAGLIN: Thank you, Mr. Edgar.

Next is Sport Fishing Institute, and they have filed a statement and there is no indication they intend to appear for an oral presentation. I take it from Mr. Edgar's remarks that this takes care of Nuclear Materials and Equipment Corporation?

MR. EDGAR: That's correct.

CHAIRMAN PAGLIN: Thank you.

Next is the Consolidated National Intervenors and the Union of Concerned Scientists of Washington. Mr. Roisman.

MR. ROISMAN: My name is Anthony Roisman. I represent those two groups which, as we indicated in our filing, will be making a single presentation. I think that for us, perhaps different than the other participants who have spoken so far today, we see the hearing in a somewhat different context and because of that and since it reflects on the question of oral presentation time, I would, if I could, **[22]** take a moment to explain that.

As you may know, this is the first time the Atomic Energy Commission has brought into the open for public discussion, the question of—particularly of nuclear waste reprocessing and waste disposal from an environmental standpoint. This is a time that we feel is important to get some things before the public that have not previously been there. We are not wholly satisfied with the survey as a substantive document and note that other participants have similar problems with it. We trust that the public, represented through the press and individuals, will come to the hearings and will orally hear much of what has not previously been heard. We think the oral presentations are extremely important because we know that there is a certain unwillingness to track down in the public document room of the Atomic Energy Commission and read bulky materials such as this or what we will be submitting in writing after the conclusion of the hearing.

We think that there is a useful purpose in getting a number of things out in the open at the hearing. We, therefore, expect to cover all aspects of the fuel cycle, as well as the legal questions raised in the course of our presentations; not in detail, that is individual figures and statistics. Those will come up in a written comment; but rather to do an adequate job of highlighting the problems. We **[23]** think that is going to take something in the nature of 180 minutes. We will be covering seven areas and I will go briefly over those now in addition to the legal questions. **[24]**

One is the uranium mining operations area. We will be discussing miner's exposure to radon and solid mine waste disposal, both disposal piles and radium contamination of water as well as the use of tailings in construction.

The fuel enrichment area will be concerned with toxiological problems, effects on workers, toxic waste.

Transportation of weapons grade material will be concerned primarily with the diversion for terrorist purposes.

In the fuel utilization area we will be discussing the radiological effects of planned releases of activity, gaseous liquid and food chains, and the radiological effects of the massive accident probabilities, including sabotage and possible consequences.

In the transportation of radioactive wastes we will be concerned with accidents, chances and mechanisms, and the consequences.

In the area of fuel reprocessing plants, we will deal with planned and unplanned releases, local and global, quanties, and consequences.

We will talk about technical improvement which could be made in the area and recommendations in the area.

Finally in the waste storage discussion we will be dealing with the history of unplanned releases, methods of disposal: salt mines, ocean dumping, Hanford solar, [25] the future ethical and moral problems, and required government stability, recommendations, and alternatives.
[26]

In all of the seven areas we will be following the general outline. In an introductory comment we will talk of the scope of the subject, the review of the approach, the summary of results, conclusions.

We will have a historical segment which will discuss appropriate past weaknesses and thereby display lessons which can be learned from the past.

The body of the discussion will deal with the methods that are used to analyze the environmental effects, input data, results, and conclusions.

Finally, we will make recommendations in each one of the areas.

Needless to say this presented orally will be in a summary form of what will eventually be presented in written form.

Our written comments will be filed within the 30-day post hearing comment period in order to take advantage of the comments made by other parties and to incorporate them into the final report.

What we hope to produce in that period of time and are working on now is in effect, another environmental survey of the nuclear fuel cycle that more thoroughly discusses this serious environmental consequence associated with the fuel cycle.

In addition, we will be making a legal presentation, [27] that is, what are the legal consequences associated with the choices that the Commission has made and whether those represent the realistic alternative legal choices or are there other possible legal positions which the Commission could or should be taking.

In the course of that discussion, which will be very short, I will be making the presentation. During the remaining part the presentation will be made by technical people whom I tentatively identified when I filed our Notice of Intent to participate. But as I indicated there, that may well change partly depending upon what we hope will be resolved today. That is the time when our people will be on, that is the date certain so that we can arrange their traveling schedules.

Many of them are teaching at universities and have potential conflicts that cannot be resolved.

We will take whatever date the Board gives us at this hearing or subsequently and simply arrange our witnesses based upon the available time.

We do not think that the 180 minutes will be in any way repetitive of the detail that will appear in the written statements, but we do think it will be extremely important to prevent any misunderstanding of our position or any misunderstanding on the subject matter of the environmental effects of the nuclear fuel cycle.
[28]

We realize that it is somewhat longer than what the other parties have so far requested, but in the same vein as with the atomic industrial form, we indicate the conglomeration of the intervenors across the country and while there are individuals who are participants in the National Intervenors, who will be appearing here separately such as Sierra Club and the — Mr. Gadler, nonetheless, their

presentations will by comparison be quite small. We are trying to do the overall picture.

Given that, the representatives of the vendors of the industry and of the Commission, to some extent are on the opposite side and don't think that the request for 160 minutes is particularly unreasonable to get a full presentation of our needs.

Finally, we are under the impression Mr. Smiley advised me of —

CHAIRMAN PAGLIN: Beg pardon?

MR. ROISMAN: Mr. Smiley advised me, I spoke with him on the phone, the hearing had been reserved for seven hearing days — two the first week and five the second.

Based upon that, it would seem for the number of participants we do have enough time even if we stay within the outer bounds. Maybe that was the Commission's conservative assumption regarding the length of the hearing and they perhaps — we represent the unanticipated event.
[29]

In any case, we feel that the time we requested will be essential to make a meaningful participation and hope that the Board will give it serious consideration.

Thank you.

CHAIRMAN PAGLIN: Thank you, Mr. Roisman.

I might comment by way of a footnote that as far as the Board members are concerned, we had not attempted to make an estimate of the length of the hearing, awaiting the very purpose of this planning session so we could get some idea of the parameters of the proceeding.

I have no present idea how long we will need. I am following the mandate of the Commission that this should be an expeditious hearing albeit an informal one.

I thank you for your statement, Mr. Roisman.

We will certainly give it very serious consideration.

Do the Board members have any questions of Mr. Roisman at this stage, because it is a little unusual, if the other participants will permit me, because of the rather unique nature of Mr. Roisman's comments now as contrasted with the others? At this stage, the Board members would like to ask questions, or would you prefer to go through the list and come back up?

DR. GEYER: I would like to suggest to Mr. Roisman that it might be helpful if he would give us a list [30] of the people he is representing.

We had that in other hearings, but I think it would be nice to have it here.

MR. ROISMAN: You mean the list of participants in the National Intervenors?

DR. GEYER: Yes.

MR. ROISMAN: I will be glad to provide that to the Board and we will do it in a number of days.

DR. GEYER: Thank you.

CHAIRMAN PAGLIN: May we now continue?

Next on the list is Westinghouse Electric Corporation.

MR. LINDLEY: I am Peter Lindley of Westinghouse.

Westinghouse would like the opportunity to enter a brief oral statement, probably 15 to 30 minutes in length.

This staement will concentrate in the main on the areas of the fuel cycling which we are interested in, but we would like to offer comments upon the alternatives before the Board.

Our presentation — we — will be given by Mr. W. J. Dollard, General Manager of the Nuclear Fuel Division. But we would like the opportunity, if necessary, because of his schedule to put — to have the statement made by some other designated person.

CHAIRMAN PAGLIN: That would be acceptable. Thank you, sir.

[31]

Next on the list is the Edison Electric Institute, but my recollection is that Mr. Upton indicated you would cover that? You would cover for them?

MR. UPTON: Yes. I have already covered the extent of the participation.

CHAIRMAN PAGLIN: Thank you.

Next is — with the new name being changed throughout the country, Exxon Nuclear Company. Did you bring the tiger?

MR. NELSON: I am Roy Nelson. We will file a written statement with possible oral statement that will take five minutes.

CHAIRMAN PAGLIN: You said possible oral statement. You don't know at this stage?

MR. NELSON: I don't know at this stage.

CHAIRMAN PAGLIN: Is there some way the Board can know whether or not you want oral time allocated?

MR. NELSON: We will let you know in a few days.

CHAIRMAN PAGLIN: Fine. Thank you very much. I have the electric utility group by Mr. Freeman.

MR. FREEMAN: I am George C. Freeman, Jr., with the law firm of Hunton, Williams, Gay & Gibson, Richmond, Virginia. I am appearing for the following electric utilities.

and also the counsel listed in our notice of appearance which I will not repeat at this time:

[32]

Baltimore Gas & Electric Company. I might indicate, though, Mr. Robert Buchanan of the legal department of Baltimore Gas & Electric Company is with us today.

Boston Edison Company.

Consumers Power Company.

General Public Utilities Corporation.

Long Island Lighting Company.

New England Electric System.

Northeast Utilities Company —

CHAIRMAN PAGLIN: Excuse me. May I interrupt you?

MR. FREEMAN: Yes, sir.

CHAIRMAN PAGLIN: Did we have the listing wrong? You call it New England — we have New England Power Service Company. Is that different from the one you just read?

MR. FREEMAN: Yes, sir. It should be listed as New England Electric System.

Northeast Utilities Company.

Pacific Gas & Electric Company.

Philadelphia Electric Company.

I might indicate that Public Service Company of New Hampshire has indicated that they will not participate in this rulemaking, and therefore they ask their name be deleted.

But continuing the utilities that we are here representing — Public Service Electric & Gas Company.
[33]

San Diego Gas & Electric Company.

Southern California Edison Company.

Virginia Electric & Power Company.

Yankee Atomic Electric Company.

On behalf of these companies, we have already submitted written comments for the record. We would like to reserve, if possible, 30 minutes of time. We would hope that we would be permitted to come before the last of the persons commenting for the following reasons:

First, we would not repeat in any oral statement the details of our written comments. We would, however, like to be available to briefly summarize our preference for alternative two and to answer any questions the Board might have of these utilities with regard to that preference.

Second, we are concerned, vitally concerned, with the interface between this rulemaking and the proposed rule and individual licensing cases.

The issue of the relationship of this proceeding and the survey and individual licensing cases has been raised in several pending licensing cases for members of our group.

Finally, we would like to be able to perhaps respond and comment on crucial technical questions which might particularly affect the utility industry as they may be raised in the comments of others preceding us in the [34] proceedings. We would estimate at a maximum 30 minutes that would be required for that purpose, and if, indeed, when the time came we felt it would not be in the public interest or our clients' interest or to the Board's interest to take that time, we would, of course, not do so.

CHAIRMAN PAGLIN: Thank you, Mr. Freeman.

The S. M. Stoller Corporation? I recall now Mr. Stoller called our office and indicated that he would not have someone present — Dr. Leonard Geller?

DR. GELLER: I am here.

CHAIRMAN PAGLIN: May I tell Dr. Geller what's involved?

We are calling the list of participants and asking them to indicate whether they will want to make oral presentation in addition to the written submission; if so, what areas will be covered and how much time they will need.

Can you — catch your breath — say something?

DR. GELLER: I would say five to 10 minutes.

CHAIRMAN PAGLIN: What areas do you think you will cover?

DR. GELLER: I don't know yet.

CHAIRMAN PAGLIN: Thank you very much.

For your benefit, sir, there is a transcript being made of this planning session so that you can find out what went on before you arrived.
[35]

The New York State Atomic Energy Council?

Anyone here on their behalf?

(No response.)

Consolidated Edison has indicated they will file a statement and not requested —

MR. UPTON: Mr. Chairman, Consolidated Edison is one of the group on behalf of which I filed a statement.

CHAIRMAN PAGLIN: I hope you have a better chance at keeping track of your clients than I am.

(Laughter.)

Thank you, sir.

New York Public Service Commission?

(No response.)

The Natural Resources Defense Council, is that — that's the group I told you about that asked for the extension of time.

Gulf United Nuclear Fuels has indicated they will only file a statement.

And Franklin L. Gage has filed a statement and I don't know whether or not he's indicated he wishes to appear. I won't take up the time of the group. We will look into the question of whether or not his letter indicated he will need time. If he does, we will schedule him accordingly.

Now are there any questions from the participants up to this point as to the procedures which will be followed? **[36]**

MR. FREEMAN: Mr. Chairman?

CHAIRMAN PAGLIN: Yes, Mr. Freeman?

MR. FREEMAN: I take it under the procedures which will be followed here that there will not be the usual service of various statements, motions, and papers, on counsel for the various participants; that that is not in the overall format. I would like to ask an — ask as a matter of courtesy among counsel that are here that we agree on such an understanding, and I, for my part, would be delighted to furnish copies of any materials which we filed on behalf of the 14 utilities which we are representing, and would

appreciate copies being sent to us. I think it — as far as the Staff were concerned, they intend to do that.

MR. MURRAY: Yes, that's right.

MR. FREEMAN: I think it would be very helpful for all of us, though, if we could, because to the extent we would make oral statements, having material in advance would be of assistance and save the time of everyone.

CHAIRMAN PAGLIN: Does the Staff have a view on that?

MR. MURRAY: Yes, Mr. Chairman. We fully intend, as Mr. Freeman anticipates, to make available everything we have in writing in this whole area to every participant who indicates an interest in receiving this material. We are assuming anyone who is on this list that we have before us **[37]** has indicated such an interest. We think it is a good idea. We don't wish to impose that view on anybody. It is not formally within the prescribed format for the proceeding, but we certainly will follow it ourselves, and we are glad to hear that the utilities will be following it.

CHAIRMAN PAGLIN: You will do so in advance?

MR. MURRAY: Oh, yes. As soon as they are available. **[38]**

DR. GEYER: Will you provide a list of the people whom you are sending the material to, the other participants?

MR. MURRAY: Dr. Geyer, I am using the Chairman's list.

DR. GEYER: Mr. Murray indicates he will be sending it to everybody on this list.

MR. UPTON: Well, Mr. Chairman, the Chairman's list has to be revised in part.

CHAIRMAN PAGLIN: Yes, we are going to take the transcript and revise the list.

MR. UPTON: I can't imagine why all the lawyers involved — I hope the lawyers won't assume too much of a role in this proceeding. I feel this is very much like — it is a legislative type hearing and I think there's a difference in my role as a lawyer and — in a legislative type hearing when I accompany a client who is going to testify before a congressional committee and my role as a lawyer when I am handling a licensing proceeding or a court case.

The two roles of course are very different. In the congressional committee situation, the lawyer's role willingly or unwillingly is somewhat more muted, and that's somewhat the way I see the lawyer's role in this proceeding.

Certainly we are delighted to send copies of anything that we file either on behalf of the Edison Electric Institute or the eight organizations that I named to everyone else who [39] appears on this list.

CHAIRMAN PAGLIN: Thank you.

MR. ROISMAN: I am all in favor of Mr. Freeman's suggestion but I wonder if the staff would make available a list of the addresses on it so that we could make the services to the appropriate people and also where there are multiple people listed — for instance I notice here that individuals are listed who are with the individual companies or concerns and are not in Washington, but they are today represented by counsel from Washington.

If service is preferred on one or the other, maybe they could indicate an address to which those documents could be served.

CHAIRMAN PAGLIN: I think that's a useful suggestion.

Mr. Murray, would it be possible for us to get together an exact and accurate list with the names of people and addresses to whom they should be sent? I think it would be useful to us as well.

MR. MURRAY: I am sure we could do that, Mr. Chairman. When I said I am using the Chairman's list, I perhaps was aware of the fact that the Chairman, I believe you indicated —

CHAIRMAN PAGLIN: Is an informal list.

MR. MURRAY: — had developed it based on the [40] filings that the AEC secretariat office had, and of course these filings have addresses on them.

I think they were left off here because they weren't germane for this purpose.

CHAIRMAN PAGLIN: Also made up from some signatures that were not legible by the way.

(Laughter.)

I think perhaps, Mr. Murray, it would be useful once we make up such a list to distribute it to the participants.

MR. MURRAY: We will do that.

CHAIRMAN PAGLIN: Thank you.

MR. GLEASON: In response to your statement before, about the oral statement, I should point out that the forum does intend to file extensive written comments on this survey. However, we did not file them by January 15th as was set out in the written notice and it is doubtful that we will file them by February 1st and the reason for that is the scope of our review.

We simply could not be concluded within that time frame so that it may be that when we make our oral statement, we

will still not have written our extended written comment; they will not have been submitted to you.

We would attempt not to repeat or to duplicate things which would be more appropriate in written comments. **[41]** The fact is you probably will not have our written comments by that time and that may present somewhat of a difficulty in the Board understanding what our position is; and for that reason, it may require a little bit more time to explain it than if we had had the time to file the written statements and the Board had had the opportunity to read it ahead of time.

I regret that is the situation. It is not as a result of intentional procrastination on our part. It is the result of the extensive review that we are subjecting the environmental survey to.

CHAIRMAN PAGLIN: Mr. Gleason, may I make this request of my fellow Board members? Would it be possible for you — I understand what you are telling us — would it be possible for you to make some efforts to be of assistance to the Board in this advance preparation because again the only questioning will be by the Board.

Mr. Roisman, in making his statement this morning, indicated with some specificity the areas that would be dealt with in their presentation. Would it be possible for you to do that? Do the Board members think that would be useful?

(Board conference.)

DR. GEYER: I think so.

CHAIRMAN PAGLIN: The Board seems to think that would be useful. Would it be possible for you to give us that assistance?

[42]

MR. GLEASON: Mr. Chairman, I am not prepared to do that today.

CHAIRMAN PAGLIN: Not today. I am saying before February 1st.

MR. GLEASON: Before February 1st I will. I can give you a general outline right now which I attempted to do before. We will concentrate in our statement on an analysis of the substance of the environmental survey. We think that there are areas that we would like to touch on with respect to the accuracy of some of the material, with respect to the scope of the document, with respect to some of the methodological approaches, so that we think that the evaluation of the survey will be in some depth.

That would constitute the bulk of our presentation. We would like to address ourselves also to the alternative rules, but that will be done in a more general fashion.

I believe Mr. Roisman indicated that their written comments would not be submitted until some time after their oral presentation and within the 30-day period thereafter.

We would intend to file ours as soon as possible, perhaps prior to February 1st if it is feasible so that you will have the benefit of the comments as soon as possible.

Nevertheless, I think we find ourselves somewhat in the same situation with respect to being able to make an oral **[43]** statement which will be helpful to the Board.

CHAIRMAN PAGLIN: Dr. Steindler?

DR. STEINDLER: I wonder if I might address myself to that comment and to the one Mr. Roisman made

and also one of the gentlemen I think from Westinghouse indicated that the statement may be made by an alternate.

One of the things we are interested in is being able to examine the statements presumably on the basis of technical detail, and the alternate in particular; and I can appreciate the problem he might well have, and the principal speakers in general, I trust will be capable of fielding questions on the substance of their presentation in such a way as to allow us to examine those areas in which there is either serious disagreement or challenge or some such so that we don't end up with unchallengeable or unexplainable statements that kind of sit in the record and that we can't really use; the intent being here obviously to provide for as much information for the Commission as we can possibly get.

In summary, then, what I am looking for is those people who present technical discussions, either a critique of the environmental statement as issued or a supplemental statement that deals with that topic should be prepared, it seems to me, to be technically competent in the area—at least to the point of being able to answer questions.
[44]

The other comment I would like to make is that in all instances it seems to me appropriate that the presentations, particularly the oral ones, should focus as closely as possible on the content of the Federal Register notice and continue to focus on the questions that are really before the House; and if we can continue to bring back all of the discussion to the main central issues, then I think we can provide for the Commission a useful transcript they can use in their subsequent deliberations.
[45]

CHAIRMAN PAGLIN: Thank you, Dr. Steindler.

Did you have any comment? The gentleman there?

MR. RESTRICK: It appears to us it may be difficult for the Board to file—to ask questions where the people are filing written statements after the Board is over. Is it intended by the Board they would file written questions with people on the supplemental statements et cetera? Or are they going to go in as filed?

CHAIRMAN PAGLIN: We have not addressed that question specifically. I know it is certainly not my present intention to keep the record open in the matter. I think it would depend upon how the record develops. I regret that I can't give you a specific answer right now.

MR. RESTRICK: It appears two major groups will not be filing detailed comments until after the hearing.

CHAIRMAN PAGLIN: That is true and it does present some difficulty. It may be that a further session may have to be held. I just don't know at this stage.

How do my brethren feel about it?

DR. GEYER: Well, it seems to me that if we could have something from the Atomic Industrial Forum prior to their oral comments, it might help us in discussing the problems they are having.

MR. GLEASON: Dr. Geyer, we will submit as much as we can to the Board prior to the commencement of the hearing [46] and if that is no more than a general outline of what we will cover, we will at least do that. We will make every effort to give you the benefit of our thinking prior to our oral statement.

DR. STEINDLER: The present apparent lack of open-end time for submission of statements, I think, makes it even more important that the written comments are en-

tirely self-explanatory and reasonably carefully edited so as to stand on their own feet. I think if that is done, as the Chairman pointed out, the record itself may, in fact, be sufficient as it is submitted.

MR. UPTON: Mr. Chairman, I am still not entirely clear about what is going to come first in connection with these statements and comments and I would just like to suggest to the Board the way it sort of runs in my mind and see if I am right or if the Board has some other idea in mind and so forth. It seems to me that, again I keep trying to think in the context of a Congressional committee hearing because that is the way I try to think in this kind of proceeding. Ordinarily when someone appears at a Congressional committee hearing they have to submit in writing the testimony they are going to give before they appear at the committee hearings.

Sometimes they read the testimony which is usually pretty much a waste of time, I can assure you. And at other times they are allowed to summarize orally various aspects of the [47] testimony and point out other things that they think should be pointed out that didn't appear in the testimony.

Now, I don't see why we can't all be expected — and maybe I am taking this too lightly because at the moment I don't expect to make any oral presentation at the hearing, but I don't see why we can't all follow that procedure here by submitting what I would call our position in chief in writing before the hearing begins and then summarizing or clarifying or highlighting that written position while the hearing is being conducted, and then not trying to anticipate at that point what our response is going to be to what the position of all the other parties is, but trying to make those

responses after the hearing in the comments which everyone is permitted to file, written comments, after the hearing record is concluded.

What I am afraid of is if we don't watch out we are going to wind up with a situation where everyone is jockeying for position to come last in appearing at the hearing because he wants to be sure he has got the last word on what the other fellow said. I would hope that could be avoided.

CHAIRMAN PAGLIN: I think those are significant comments and I thank you for them. In fact, they seem to be at base contemplated by the supplemental notice and I quote to you from the notice and this is the notice of December 27, I believe. Yes, the supplemental notice in which [48] the Commission contemplated that — and I am quoting, "Relevant written statements may be received for the record and those participating may, depending upon the number of requests received and the time available, be permitted to make brief oral statements of their views either in addition to or in lieu of written submissions."

Again going back to my opening remarks, it is my understanding of the intention of the Commission that written comments on the survey, on the proposed amendments, to wit the alternatives, were to be filed by January 15.

It seems to me the Commission contemplated this would be a legislative type hearing, oral presentation, which would be in addition to the written submission and would permit the highlighting of the main points of the written submissions and permit the Board to question — in order to point up the issues. It is true we will be faced with the dilemma about the situation that you have described and Dr. Steindler has indicated one of the things that should be followed in making this a more meaningful and expeditious

record. It may be that the Board may find it necessary to prescribe that written submissions be put in before the oral hearing and then proceed the way the Commission wanted us to proceed.

We will have to take that under advisement. I understand the problems of the organizations which have indicated **[49]** they have got problems in preparing this stuff in time, and it may be that the time schedule may have to allow itself some flexibility. I don't know yet.

[50]

MR. ROISMAN: Mr. Chairman?

CHAIRMAN PAGLIN: Mr. Roisman?

MR. ROISMAN: If I could, I would like to indicate — perhaps there has been misunderstanding on what we have been doing and I hope this will respond to the questions by Dr. Steindler and Dr. Geyer — we do intend, at least within the time frame that you indicated at the commencement of the hearing today, 48 hours before the commencement of the oral hearing, to give a fairly detailed statement of what our "position" is. I think Mr. Upton put it our position in chief; what we will not be prepared to submit at that time simply because of the technical problems of getting this together and putting it in the final form is the completed document, something that will look like this in form, which will incorporate into it our comments on the various positions taken by parties at the hearing and so forth, and try to represent the definitive position of our two groups, National Intervenors, and Union of Concerned Scientists.

I should hope the Board will be well aware of not only the areas which I gave you this morning, but also our position with respect to each of those areas and the major

questions and concerns that we have in those areas well in advance of the hearing.

Secondly, no matter what witnesses we bring down, they will be more than well qualified to answer the **[51]** questions in the area in which they are testifying. It happens that in several areas we have more than one person working and the chief person may not be available, but someone who's been available — but someone who's been working with that person will be available. Certainly we will not be bringing down witnesses who cannot respond to questions asked by the Board in the technical area that is pertinent to that particular area.

Finally, the written document that will be submitted both before the hearing, as well as the final one, will stand on its own. It will not be — not need to be referenced other than references in the technical document outside of the purposes of this proceeding.

CHAIRMAN PAGLIN: Mr. Gleason wanted to be recognized, I thought? No?

Okay. Mr. Freeman.

MR. FREEMAN: Mr. Chairman, since in our written document we made certain procedural recommendations which the Board had contemplated and indeed addressed itself to, and we have discussed some of the procedures to be followed, I just simply would like to make certain on the record that we correctly understand the position of the Board.

The Board indicated that while questions and answers by participants and the general Staff would not be appropriate to this hearing, to the extent, I believe the Chairman said, **[52]** the participants want to raise questions or have concerns, they may reflect them in their written comments,

in their oral comments, and in the supplemental written statements.

I would hope that the Board in fashioning any requirement for the submission of written statements in advance of oral statements, would still permit parties the flexibility to voice concerns which may have been raised in the interim.

CHAIRMAN PAGLIN: Oh, yes.

MR. FREEMAN: About statements by other persons, and indeed if they still have concerns that are voiced in the supplemental written statements and in the opinion of the Board these raise substantial factual situations, it seems to me the Board, as the Chairman just indicated, might entertain a further hearing session if it felt that the record needed supplementing on this line, so that the concerns, legitimate concerns of everyone, could be covered both in terms of being expressed and answered in substance on this record; and that would be a help to the Commission and to the public.

CHAIRMAN PAGLIN: Thank you, Mr. Freeman. I take it you were making reference to the document you handed me this morning?

MR. FREEMAN: Yes, sir.

CHAIRMAN PAGLIN: Yes. We will keep that in mind, [53] the points you make.

Are there any other comments by the participants? Mr. Gleason?

MR. GLEASON: Mr. Chairman, there is an issue item that has come up in our thinking about the position we might take with respect to alternatives one and two. I addressed a letter to Mr. Muncie on January 9 which I re-

gret I did not also send to the Board. I did not do it because it was in the nature of asking a clarifying question. Basically it deals with the interpretation which the Regulatory Staff puts on alternative one and I think it would serve — save a great deal of time in the oral presentations if the Staff was prepared to state its position on the interpretation of alternative one, either at this time or at some time prior to the start of the hearing, because otherwise I think we will spend a great deal of time in oral discussion trying to figure out what the Staff's position is.

CHAIRMAN PAGLIN: Mr. Murray, would you respond?

MR. MURRAY: I think I can help Mr. Gleason on that, Mr. Chairman. There is an error in the alternative number one. Looking at the reprint from the Federal Register, page 24192, containing the notice of proposed rulemaking, looking at the third column where alternative one appears, going to the middle of that column to the end of alternative one, that is, and counting up, one, two, three, four, five, [54] six, seven, eight lines, there is a line that begins, "Cycle and when factored into the cost," the "when" appearing in that line should be an "if."

This is a substantive change in the nature of alternative number one. It is the original intention.

MR. GLEASON: Would you also change the "are" in the next line to "would be"?

MR. MURRAY: If I were a stickler for proper English, I would.

(Laughter.)

CHAIRMAN PAGLIN: And you are changing it, right?

MR. MURRAY: I shall.

(Laughter.)

MR. GLEASON: Thanks a lot.

Mr. Chairman, I take it that, therefore, that there is no need in the hearing for us to address ourselves to alternative one in its uncorrected version. We will just assume, for purposes of the hearing, that it reads as it was just corrected.

CHAIRMAN PAGLIN: And all other participants may so regard it as well.

Mr. Roisman?

[55]

MR. ROISMAN: Mr. Gleason's question seems to raise a point that I am not sure we need to get into, in the hearing. As I understand it, whatever the Staff may have thought Alternative One meant, any party is free to suggest yet a third alternative to the Staff or to explain how they would be interpreting Alternative One or Two, if they were supporting them, or opposing them.

I take it we are not being faced with a fait accompli by the Commissioner, did I understand that to be the nature of the hearing which is that they said, you must choose between Alternative One or Two.

If you don't like it, that is tough.

They are willing to consider an Alternative Three, Four, Five, or Six.

Secondly, if I understand what the Board has indicated will happen after this prehearing conference is over, that the Board will issue a statement identifying the people who will testify at the hearing or rally, the amount of time

given, and for our purposes, I hope a specified time when that will happen; a day certain, and within some amount of leeway, a time certain, on that particular day.

Quite to the contrary of what Mr. Upton suggested, we have no interest in going last. If he prefers, we would be happy to go first, deferring, of course, to the Staff's general desire to do so.

[56]

All we need to know is, since we are bringing a lot of people in from out of town, we need to know what day we are going to go. When we know that, we can schedule accordingly.

Am I correct in assuming that is what the Board will be doing after this hearing?

CHAIRMAN PAGLIN: You have anticipated, correctly, Mr. Roisman.

My next point is to close the session, if there were not anything else.

That is, the Board will issue a further notice, as soon as possible in order to give the participants as much advance notice as possible.

What we propose to do is set up schedules, if we can, devoted to day and date and time, if we can organize them, in a logical manner, for the convenience of the parties; and also for the making of a decent record.

We will indicate in this notice, the time to be allotted to each group, participant, or individual.

I might indicate if there is nothing else, or no other questions, just by way for the record, the record that is being made; the transcription of the proceedings this morning, will not be made a part of the record in the pro-

ceedings, the formal record, which the Commission has requested be certified to it.

[57]

Our purpose in holding this session was, as I have indicated, and what has begun to come out, and that is for the convenience of the Board and the participants and in order to organize an effective and expeditious proceeding.

We don't see the need at this stage, to make this a formal part of the record, which will be certified.

If there are no other comments, I just want to indicate, for the record, the Board will apparently without objection, grant the request for extension of time by Sierra and Natural Resources defense counsel, for a reasonable extension of time.

I think I indicated it was either ten days or two weeks.

If there is nothing else, this procedure planning session — I see Mr. Murray?

MR. MURRAY: I thought it might be useful to remind everyone here that the hearing itself, is, I believe, in the room next door.

CHAIRMAN PAGLIN: Thank you for reminding me.

It will be in this area, but it will be in the Closed-Conference Room, next door, at 10 a.m.

Mr. Freeman?

MR. FREEMAN: Mr. Chairman, I hope the Board will reconsider its decision about not having this — the transcript of this prehearing conference made a part of the official record.

[58]

I think it would be important that it be so, because the Board has, in further discussions this morning, illuminated

and clarified the extent to which people will be permitted to participate and the ways in which the substantive concerns that they have, might be clearly put before the Board, and made a part of this proceeding, and I think that, if, at some future date, a court is concerned with the procedural interface of this rule-making and the procedures being followed by the Commission here, with individual licensing cases, it will be very helpful to have that part of the record.

CHAIRMAN PAGLIN: Well, you raise a good point, Mr. Freeman. I say, initially, it was our intention that this was for the convenience of the Board, so that we would have an accurate record of what the understandings were, and so on.

The point you raise is a reasonable one. It may very well be that it may serve a purpose, making it part of the record.

We can take that under advisement. I don't feel strongly, one way or the other. As I say, it was our intention, this being a rather novel procedure, that we had intended this to be kind of informal, and as I say, for purposes of accuracy, to have a record made.

I don't, at this stage, see any basic objection. We will take it under advisement.

MR. FREEMAN: Thank you, very much.

[59]

CHAIRMAN PAGLIN: All right, if there is nothing else, I thank all of you for coming, and you will be hearing from us by way of formal notice, soon.

Thank you, again.

(Whereupon at 11:20 a.m., Wednesday, January 17, 1973, the Prehearing was adjourned.)

[60]

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF:	Docket No. RM-50-3
URANIUM FUEL CYCLE	

New Executive Office Building
Room G2008
17th & H Streets
Washington, D. C.

Thursday, 1 February 1973

The above-entitled matter came on for hearing, pursuant to notice, at 10 a.m.

BEFORE:

M. D. PAGLIN, ESQ., Chairman.
DR. JOHN C. GEYER, Member.
DR. M. J. STEINDLER, Member.

APPEARANCES:

(As heretofore noted.)

ADDITIONAL APPEARANCES:

ARVIN E. UPTON, ESQ. and JAMES P. MC GRANERY, JR., ESQ., Lebauf, Lamb, Leeby & MacRae, 1821 Jefferson Place, N. W., Washington, D. C., on behalf of Alabama Power Company, et al.

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PROCEEDINGS

CHAIRMAN PAGLIN: Good morning, ladies and gentlemen. May we come to order. This is an informal rulemaking hearing in Docket RM-50-3, which is being held pursuant to notice of proposed rulemaking published in the Federal Register on November 15, 1972, by the Atomic Energy Commission. The Commission's notice of proposed rulemaking concerns possible amendments to Part 50, Appendix D of its rules, which would deal specifically with the question of consideration of environmental effects associated with the uranium fuel cycle and the individual cost/benefit analyses for light water cooled power reactors.

In conjunction with this rulemaking, the Commission's Regulatory Staff at the same time issued for comment and environmental survey of the effects associated with producing the annual requirements for uranium nuclear fuel of a model light water cooled reactor, capable of producing 1,000 megawatts of electricity.

The environmental survey, which was to serve as the basis for the rulemaking hearing, describes the effect of each stage of the cycle, from the mining and milling of natural uranium to the ultimate disposal of high-level radioactive wastes resulting from reprocessing of the used fuel.

The notice of rulemaking invited the comments of [63] interested persons and scheduled an informal rulemaking hearing on February 1, 1973, to permit the presentation of views, both oral and written, on two alternative approaches to consideration of the environmental effects of the uranium fuel cycle and environmental statements in terms of possible amendments to Part 50.

The alternatives were set out in the Commission's notice of November 15. It is to be noted for the record that the language of Alternative 1 is to be considered amended, in accordance with a letter dated January 22, 1973, from Mr. Murray of the Regulatory Staff, in the following respects: The language to be amended appears in the right-hand column of page 24192 of the Federal Register of November 15, 1972, and concerns the revision of language in the penultimate sentence in paragraph (1).

The latter part of that sentence as amended will read, "Activities as related to a particular light water cooled nuclear reactor have been analyzed in the Commission's environmental survey of the nuclear fuel cycle, and if factored into the cost/benefit analysis, would be sufficiently small as not to affect significantly the resultant conclusion."

Thereafter in a supplemental notice of rulemaking issued on December 27, 1972, the Commission set forth the procedural conditions which would be followed in this [64] informal legislative type rulemaking hearing. It was specified, among other things, that since this would be part of a rulemaking rather than an adjudicatory proceeding, the provisions of subpart (g), "Rules of General Applicability," of Part 2 of the Commission's rules of practice, would not be applicable and that no discovery or cross-examination would be utilized in this proceeding. However, the notice provided that the participants in the hearing would be subject to questioning by the presiding Hearing Board.

Thereafter, on January 17, 1973, and pursuant to the supplemental notice, to authorization in the supplemental notice, the Hearing Board named by the Commission conducted a procedure planning session at which all participants in this proceeding were invited.

As a result of that session, a further notice of rulemaking hearing was issued by the Hearing Board on January 19, setting forth, among other things, the schedules of appearances for participants who are to make oral presentations, in addition to written submissions, and a statement of the understandings and agreements expressed by the participants at that session.

There was attached to that further notice of hearing a list of names and addresses of all of the participants who had filed statements in this proceeding, and it was agreed by those present that the written submissions to **[65]** be offered by the participants would be provided to the other participants in ths proceeding named on the list.

Subsequent to the issuance of the further notice of hearing, certain changes were made in the schedule for appearances set out in that notice by the agreement of the participants and the consent of the Board. The principal change is that the Consolidated National Intervenors and the Union of Concerned Scientists will make their presentation on the afternoon of Thursday, February 1, that is today, instead of their previously scheduled appearance on Friday morning, it having been agreed among the parties that they would exchange positions with the Thursday afternoon scheduled participants.

In addition, I have been advised by Mr. Dzugan of the Minnesota Pollution Control Agency that he will appear at the conclusion of the session on Friday, February 2, in lieu of his scheduled appearance this morning.

In commencing this rulemaking hearing, the Board has determined the following documents shall be incorporated by reference in the record of this proceeding, as though they had been set forth at length at this point in the pro-

ceeding, namely, the Commission's notice of proposed rulemaking, published in the Federal Register on November 15, 1972; the environmental survey of the nuclear fuel cycle issued by the Regulatory Staff of the Commission; the **[66]** Commission's supplemental notice of rulemaking hearing issued December 27, 1972; and the further notice of rulemaking hearing issued by the Hearing Board on January 19, 1973.

I would like now to call for the appearances of the participants and their counsel, if they are accompanied by counsel, in the order in which they appear in the January 19 further notice of hearing. And thereafter, I will ask for appearances by any others who wish to make oral presentations and for whom provision has not been made in the further notice of hearing. However, it is to be understood, of course, that these latter will be heard if time is available in the sessions that have been scheduled for the next two days.

May I now, for the record, have the appearances of the Regulatory Staff of the Commission.

MR. MURRAY: Mr. Chairman, my name is James Murray; I am appearing as counsel for the Regulatory Staff of the Commission. Our principal witnesses are with me here at the table. We will have back-up personnel to help them in response to any questions the Board may ask. The principal witnesses are, immediately to my left, Mr. S. H. Smiley, and two persons removed, Dr. Frank Pittman.

CHAIRMAN PAGLIN: Thank you, Mr. Murray.

Next on the schedule in the further notice is **[67]** listed General Electric Company. We have been since advised that they do not desire to make an oral presentation, but will

be present for questioning. Is there an appearance for General Electric?

MR. RESTRICK: John Restrick, counsel for General Electric. We do have people here who can answer questions of the Board if they have any.

CHAIRMAN PAGLIN: Thank you, Mr. Restrick.

Next, U. S. Environmental Protection Agency. Is there someone present from EPA?

(No response.)

CHAIRMAN PAGLIN: We will check later on. I mentioned, but I will have the appearance now, the Minnesota Pollution Control Agency, I believe Mr. Dzugan is here now.

MR. DZUGAN: My name is Ken Dzugan, and I am here on behalf of the Minnesota Pollution Control Agency.

CHAIRMAN PAGLIN: Mr. Steve J. Gadler.

MR. GADLER: Mr. Chairman, I am Steve J. Gadler. I am here from St. Paul, Minnesota. I represent the Mapleton Intervenors and myself at this hearing.

CHAIRMAN PAGLIN: Thank you, Mr. Gadler.

Westinghouse Electric Corporation.

MR. DAUGHERTY: I am Thomas Daugherty, Westinghouse, and our principal witness, Mr. Peter Linley, is present.

CHAIRMAN PAGLIN: On behalf of the National [68] Intervenors and Union of Concerned Scientists.

MR. ROISMAN: Anthony Z. Roisman. I am appearing on behalf of the Consolidated National Intervenors and the

Union of Concerned Scientists. Our two technical witnesses will be here this afternoon, Dr. Henry Kendall, Dr. Henry Radford.

I would like to make a correction. In response to a question by Dr. Geyer, we sent in a list of the participants, and the name of the Mapleton Intervenors was included in that list interested, inadvertently. As you heard, Dr. Gadler is here and will be speaking on their behalf.

CHAIRMAN PAGLIN: Thank you, Mr. Roisman. The record will be corrected accordingly.

Going back up again, the Atomic Industrial Forum, Inc.?

MR. WIGGIN: I am Edwin Wiggin. I am with the Forum; I will be making a statement tomorrow morning. I will be accompanied by counsel, who is not yet here.

CHAIRMAN PAGLIN: Thank you, Mr. Wiggin.

Next on our list is Exxon Nuclear Company. They have also advised us that they do not desire to make an oral presentation, but will have someone present. Are they here?

MR. NILWON: Roy Nilson, representing Exxon Nuclear. We would like to have our written statement entered [69] into the record.

CHAIRMAN PAGLIN: Yes. Exxon has submitted a statement and it will be considered introduced into the record at this point.

S. M. Stoller Corporation.

DR. GELLER: I am Leonard Geller from S. M. Stoller Corporation. I will not be making an independent submittal or oral presentation. I will, instead, be working with the 14 utility group represented by Mr. Freeman.

CHAIRMAN PAGLIN: So, as I understand it, you will not make an individual oral presentation?

DR. GELLER: That is correct.

CHAIRMAN PAGLIN: Thank you.

Now, skipping down, Baltimore Gas & Electric Company and the other named utility companies appearing jointly.

MR. FREEMAN: George C. Freeman, Jr., of Hunton, Williams, Gay, Powell & Gibson of Richmond, Virginia, appearing here on behalf of that group of utilities, accompanied by Mr. David Brollier of my firm. Also Dr. Leonard Geller of S. M. Stoller Corporation is assisting us as a technical expert.

CHAIRMAN PAGLIN: Next, the New York State Atomic Energy Council. Do we have an appearance for them this morning?

[70]

MR. CASHMAN: Thomas J. Cashman, appearing on behalf of the New York State Department of Environmental Conservation. I anticipate counsel from the Atomic Energy Council will be here tomorrow. In view of the changed schedule, I cannot guarantee he will make it.

CHAIRMAN PAGLIN: Thank you, sir.

That completes the list of participants named in the notice of January 19 who sought the privilege of oral presentation.

Are there any other persons present today who are not listed, who were not here at the planning session on January 17, who would wish to make an oral presentation, provided time will be available? If so, can you state your name and your affiliation?

MR. ROWE: I wasn't here when you called the roll, but W. D. Rowe from EPA.

CHAIRMAN PAGLIN: Thank you. You will be appearing this morning, Mr. Rowe.

MR. ROWE: Yes.

CHAIRMAN PAGLIN: Hearing no response to my earlier question about additional oral presentations, we will now move along.

The first appearance, on behalf of the Regulatory Staff of the Commission, I will call on Mr. Murray.

MR. MURRAY: Yes, Mr. Chairman. Thank you very [71] much. Mr. Smiley will present the opening statement of the Commission, and followed by Dr. Pittman, who will address himself to the subject of high level waste disposal. Since we do have a number of back-up personnel here, who will possibly be answering questions, I am wondering if I shouldn't submit, for the record, at this time, the statements of qualifications of all of our people, including Mr. Smiley and Dr. Pittman, and the back-up folks, and have them incorporated in the record physically as if read.

CHAIRMAN PAGLIN: Without objection, Mr. Murray, they will be accepted.

(The documents follow.)

DONALD A. NUSSBAUMER
U.S. Atomic Energy Commission
Washington, D.C. 20545

EDUCATION

BS	Chemistry-biology	Union College, Schenectady, N.Y.	1950
1 Yr. Graduate Work	Biochemistry	Cornell University, New York, N.Y.	1951

EXPERIENCE

1972 to date — Assistant Director for Fuel Cycle
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Plan, direct and supervise nonreactor fuel cycle licensing activities of the AEC Regulatory program as carried out by the following Branches — Fuel Fabrication and Reprocessing, Transportation, Technical Support, and Materials and Plant Protection. Activities include licensing of nonreactor production and utilization facilities, including their operators, licensing of special nuclear material in quantities greater than a critical mass, approval of radioactive material shipping containers, approval of controls for safeguarding strategically important nuclear materials against diversion and protection against acts of industrial sabotage, and assessment of environmental impact of fuel cycle plants pursuant to the National Environmental Policy Act.

1970-1972 — Chief, Fuel Fabrication and Transportation Branch
Division of Materials Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Administer the technical evaluation and processing to final action all applications for and communications concerning licenses for special nuclear material in quantities greater than a critical mass. Administer the evaluation and approval of proposed designs of shipping casks for transportation of irradiated reactor fuel elements and other radioactive material from the standpoint of their adequacy to comply with regulatory standards.

1961-1970 — Chief, Source and Special Nuclear Materials Branch
Division of Material Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Administer the technical evaluation and processing to final action of all applications for and communications concerning licenses for source material and special nuclear material.

1957-1961 — Radiation Safety Specialist
Division of Licensing and Regulations
U.S. Atomic Energy Commission
Washington, D.C. 20545

Evaluation of potential radiation hazards associated with the use, storage, disposal, and transport of radioactive materials and the adequacy of engineering and administrative controls to protect against such hazards. Assists in the development of criteria, standards and operating procedures in radiation protection for use in establishing regulations and evaluating license applications.

1955-1957 — Field Representative
Oak Ridge Operations Office
U.S. Atomic Energy Commission
Oak Ridge, Tennessee

Visited firms and institutions licensed by the AEC to use radioisotopes. Advised radioisotope users in special radiation protection problems involving shielding, monitoring, instrumentation, laboratory design, ventilation and waste disposal. Checked programs to determine compliance with proper radiation safety practices.

1951-1955 Senior Health Physics Inspector — Knolls Atomic Power Laboratory, General Electric Company, Schenectady, New York

Health physics responsibilities in environmental monitoring, chemical processing of irradiated uranium, radiochemical research laboratories. Also health physics responsibilities in reactor design, startup, operation and refueling. Duties included evaluation of facility and equipment design, radiation monitoring, and establishing administrative controls for radiation safety.

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SIGNIFICANT PUBLICATIONS

"Safety Controls Over Uses of Radioactive Materials." Symposium on the Administrative and Regulatory Problems Connected with Atomic Energy Programs — University of Puerto Rico — 1959.

"USAEC Regulatory Control Program for Uranium Milling." International Symposium on Radiological Health and Safety in Mining and Milling of Nuclear Materials — International Atomic Energy Agency — Vienna, Austria — 1963.

MILITARY STATUS

1946 to 1948 Veteran — U. S. Army Medical Corps

PERSONAL

U.S. Citizen
Married
Born October 15, 1927
5 Children

THEODORE R. WORKINGER
USAEC, Bethesda, Md.

EDUCATION

BS Chemical Engineering — Univ. of Wisconsin — 1950

EXPERIENCE

1968 to present Fuel Fabrication & Reprocessing — Fuels & Materials Div. Regulatory, USAEC

Primary responsibility is the evaluation of the engineering and radiological safety design criteria and design bases for the proposed Barnwell Nuclear Fuel Plant.

713

1961 to 1968 Chemical Processing — USAEC

Assisted the development and implementation of programs and policies for Government and industrial activities in the chemical reprocessing segment of the nuclear fuel cycle. Overall staff responsibility for program planning, budgeting and management of the AEC's research and development programs, projects, and production operations pertaining to the chemical processing of irradiated reactor fuels and target materials to recover, purify, manufacture and supply special nuclear materials, fission products, transuranic products and other radioisotopes, at the AEC's separation facilities at Hanford, Idaho and Savannah River. Responsible for assisting technical exchanges with international visitors.

1958 to 1961 Division of Isotopes Development — USAEC

Responsible for administering the Commission's radioisotope production and distribution program. Implemented the development of solvent extraction processes

for the recovery, separation and purification of fission products and other radionuclides, the development of methods to ensure the safe shipment of large quantities of fission products and the development of technology for manufacturing large sealed sources for isotopic power and radiation applications.

1950 to 1958	General Electric	Hanford Atomic Prod. Operation

Shift supervision responsibilities for operations in chemical separation plants, the plutonium fabrication facility and the UO_3 conversion facility. Staff responsibility also for operator safety training, production planning and scheduling, nuclear materials management, and plant maintenance. From 1952 to 1955 senior process engineer with responsibilities for assisting with supervisor and operator training, preoperational testing, and the startup of the Redox plant, the TBP plant, and the Purex plant. In 1955, appointed Group Leader of the Process and Engineering Unit, with responsibilities for providing process engineering services to ensure the overall performance and safety of the Purex plant at Hanford. Promoted to Engineering Analyst, with responsibilities for technical evaluation and economic analysis of proposed new capital projects, and directly assisted the Manager of the Facilities Engineering Operation, Chemical Processing Department, with management studies directed toward improving the effectiveness of the design, engineering and project management components reporting to him.

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NELSON R. LEIST
National Lead Company of Ohio
P. O. Box 39158
Cincinnati, Ohio 45239
Telephone 513 738-1151

EDUCATION

Chem. Eng. Degree	Chemical Engineering	University of Cincinnati	1954
Juris Doctor Degree	Law	Chase College	1961

EXPERIENCE

1966 to date	Supervisor	Production Technology-Chemical Group National Lead Co. of Ohio

Responsible for the development of process improvements and new processes for the conversion of uranium concentrates into cascade feed materials. Duties include work associated with processes and procedures necessary for environmental protection. Specifically in the field of water and air contamination by chemical pollutants and radionuclides from the refining processes.

1961 to 1966	Section Leader	Chemical Department National Lead Co. of Ohio

Supervision of a section responsible for the devlopment of new processes and procedures associated with the liquid-liquid extraction of uranium and thorium.

1956-1961	Technologist	Chemical Department National Lead Co. of Ohio

Pilot Plant and production testing of liquid-liquid extraction processes.

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PUBLICATIONS

J. F. Blum, R. H. Ellerhorst, C. W. Huntington, J. H. Krekeler, N. R. Leist, J. R. Nelli, and M. D. Snyder, *"Refining of Thorium-containing Uranium Concentrates by Extraction with Tributyl Phosphate,"* USAEC Report, NLCO-692, August 29, 1957

N. R. Leist, *"Evaluation of a Coalescer-De-Entrainer Unit,"* USAEC Report, NLCO-725 (p. 29-34), April 18, 1958

C. T. Hicks, N. R. Leist, and J. R. Nelli, *"Laboratory and Pilot Plant Evaluation of Stanrock Uranium Concentrate,"* USAEC Report, NLCO-762, October 10, 1958

N. R. Leist and J. R. Nelli, *"Raffinate Mixer-Settler for the Primary Extraction Columns,"* USAEC Report, NLCO-805 (p. 13-21), April 29, 1960

J. H. Krekeler and N. R. Leist, *"Removal of Foreign Materials from the Refinery TBP Solvent,"* USAEC Report, NLCO-882, June 25, 1963

R. C. Kispert and N. R. Leist, *"Computerized Control of Nuclear Materials for Uranium Residue Reprocessing,"* USAEC Report, NLCO-1017, May 3, 1968

J. H. Cavendish, R. C. Kispert, N. R. Leist and G. P. Miller, *"Crystallization Characteristics of Acid Uranyl Nitrate Solutions,"* Nuclear Applications, 5:224, 1968

N. R. Leist, *"The Beneficiation and Refining of Uranium Concentrates,"* USAEC Report, NLCO-1067, April 23, 1970

R. C. Kispert, N. R. Leist, and A. F. Pennak, *"Reduction of Nitrogen Oxides in Vent Gases by Scrubbing,"* USAEC Report, NLCO-1094, October 20, 1972

ROBERT G. JORDAN
Union Carbide Corporation — Nuclear Division
P. O. Box Y
Oak Ridge, Tennessee 37830
Telephone: 615 483-8611, Ext. 3-5164

EDUCATION

B.S.	Chemistry-Physics — Ohio State University	**1942**

EXPERIENCE

1972 to date	Manager of Safety and Environmental Protection	Union Carbide Corporation Nuclear Division
1963 to 1972	Plant Superintendent Oak Ridge Gaseous Diffusion Plant	UCC-ND
1961 to 1963	Plant Superintendent Oak Ridge Y-12 Plant	UCC-ND
1954 to 1961	Plant Superintendent Paducah Gaseous Diffusion Plant	UCC-ND
1951 to 1954	Operations Superintendent Paducah Gaseous Diffusion Plant	UCC-ND
1947 to 1951	Process Engineering Department Head Oak Ridge Gaseous Diffusion Plant	UCC-ND
1943 to 1947	Process Engineer — SAM Laboratories and Oak Ridge Gaseous Diffusion Plant	UCC-ND
1942 to 1943	Engineer	Sanderson & Porter

VIRGIL S. EMLER
P. O. Box 628
Piketon, Ohio 45661
Telephone: (614) 289-2331

EDUCATION

B.S.	Met. Engr.	Carnegie-Mellon Univ. 1950

EXPERIENCE

1971 to present	Supervisor, Environmental Control Corporate responsibility for environmental control and pollution abatement.	Goodyear Atomic Corp.
1967-1971	Supervisor, Special Projects Coordination and evaluation of development laboratory projects.	Goodyear Atomic Corp.
1963-1967	Supervisor, Chemistry Dept. Developmental chemistry for gaseous diffusion process. IR Spectroscopy, spectrography, and electron microprobe labs.	Goodyear Atomic Corp.
1956-1963	Supervisor, Metallurgy Dept. Developmental metallurgy for diffusion plants. Failure-analysis lab.	Goodyear Atomic Corp.
1953-1956	Metallurgist Failure analysis.	Goodyear Atomic Corp.
1952-1953	Metallurgist Technical assistance to vendor foundries.	North American Aviation (North American-Rockwell)
1951-1952	Metallurgist Alloy development.	Battelle Memorial Institute
1948-1951	Metallographer, Metallurgist Metallography, heat-treatment studies.	Vanadium Corp. of America

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Educational and Professional Qualifications

ROBERT F. BARKER
Chief, Product Standards Branch
U.S.A.E.C.

My name is Robert F. Barker. I am Chief of the Product Standards Branch of the Directorate of Regulatory Standards of the U. S. Atomic Energy Commission, 7920 Norfolk Avenue, Bethesda, Maryland. Since assuming this position in January 1961, I have been responsible for the formulation of policy and development of regulatory safety standards, criteria, rules and regulations for the transportation of byproduct, source and special nuclear material in the Commission's licensing program. During the past 11 months, I have been responsible for preparation of the sections on transportation in about 30 environmental statements for individual nuclear power plants.

I received a Bachelor of Science in Electrical Engineering from Ohio University in 1949. I did graduate work toward a Master of Science degree in radiological physics on an AEC fellowship at the University of Rochester in 1949-50, which I received in 1953.

I was employed by the University of California at the Los Alamos Scientific Laboratory from 1950 until 1955. As assistant Leader of the General Monitoring Section, I was responsible for the monitoring operations at nuclear weapons tests, around the test reactors and for shipments coming to or leaving the Laboratory. While in that position, I compiled and edited the first General Monitoring Handbook.

In 1955, I joined the AEC as assistant Chief of the Radiation Safety Branch of the Isotopes Division and, except for the years 1959 and 1960, I have been with the Commission since that time. During 1959 and 1960, I was employed on the Staff of the International Atomic Energy Agency as a Senior Health Physicist in the Division of Health, Safety, and Waste Disposal. As part of my duties for the IAEA, I was the Secretary to the Panel of Experts called together by the Agency to establish International Standards for the Safe Transportation of Radioactive Materials.

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In subsequent meetings of Panels of Experts on Transportation of Radioactive Materials organized by the IAEA, in 1963, 1964, 1970 and 1971, I represented the AEC as participant or advisor to the designated participant.

I am a Health Physicist certified by the American Board of Health Physics.

I am a member of the Health Physics Society, the American Society for Quality Control and the Society for Non-Destructive Testing.

I am author of the Chapter on "Radiation Protection" in the Handbook on Non-Destructive Testing, an A.S.T.M. publication, co-author of a Chapter in the "Safe Transport of Radioactive Materials" edited by Roy Gibson and have written several technical papers on safety in transportation.

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JOE DYKSTRA
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EDUCATION

A.B.	Chemistry	Grinnell College	1943

EXPERIENCE

1943-1945	Hooker Chemical Company, Niagara Falls Manhattan District — Fluorine and Flurocarbon Development and Production.
1945 to date	Union Carbide Nuclear Division — Oak Ridge Gaseous Diffusion Plant.

Operations Division Supervisory assignments in gaseous diffusion cascade operqtions, equipment decontamination, uranium recovery, fluorine production. Oxide to UF_6 production, utilities production and distribution such as steam, air, potable and recirculating cooling water and diffusion plant environmental control.

Currently, Chemical Operations Department Superintendent responsible for receipt and shipment of toll enrichment feed and product and diffusion plant equipment decontamination and uranium recovery.

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PUBLICATIONS

AEC publications on Fluorine Production and Uranium Recovery.

IRVIN G. SPEAS
Union Carbide Corporation — Nuclear Division
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EDUCATION

B.S.	Mechanical Engineering —	Duke University	1949
Graduate Study	Math & Mech. Eng. Courses	University of Tennessee	1955-58

EXPERIENCE

1972 to date	Engineering Consultant	Union Carbide Corporation Nuclear Division Office of Safety and Environmental Protection Oak Ridge, Tennessee

This office is responsible for the coordination of the safety and environmental programs at the Oak Ridge National Laboratory, Oak Ridge Gaseous Diffusion Plant, Paducah Gaseous Diffusion Plant, and the Oak Ridge Y-12 Plant.

1957 to 1972	Department Superintendent	Union Carbide Corporation Nuclear Division Design Engineering Oak Ridge Y-12 Plant

Responsible for engineering studies of plant facility requirements, design of special process equipment, plant budget justification documents, design of process and utility piping systems, and environmental pollution abatement studies and designs.

1949 to 1957	Design Engineer	Union Carbide Corporation Nuclear Division Design Engineering Oak Ridge Y-12 Plant

Design of process and utility systems and associated pumps, compressors, heat exchangers, stills, and cooling towers.

ENVIRONMENTAL POLLUTION CONTROL ASSIGNMENTS

1967 to 1972 — Y-12 Plant representative on the AEC-ORO Environmental Pollution Task Force. This group is responsible for the environmental programs at the AEC facilities in Oak Ridge, Tennessee; Paducah, Kentucky; Cincinnati, Ohio; and Portsmouth, Ohio.

1970 to 1972 — Y-12 Plant representative on the Union Carbide Corporation — Nuclear Division Four-Plant Environmental Committee. This committee was responsible for apprising management of the extent and possible impact of the Division's operations upon the environment.

TECHNICAL PAPERS PRESENTED

"Survey of Municipal Refuse Incinerator Design Practices", presented before the AEC-ORO Environmental Pollution Task Force, July 13, 1967.

"Electrostatic Precipitators Versus Mechanical Collectors For Steam Plant Stack Emission Control", presented before the AEC-ORO Environmental Pollution Task Force, January 17, 1969.

"Environmental Pollution Control (Liquid, Gaseous, and Solid Wastes)", presented before the AEC National Plant Facilities Managers Meeting; Oak Ridge, Tennessee; March 14, 1969.

"Environmental Pollution Control at the Oak Ridge Y-12 Plant", presented before the Southeastern Industrial Health Conference; Gatlinburg, Tennessee; October 1, 1970.

"Experience with the Oak Ridge Centralized Sanitary Landfill", presented before the AEC Pollution Control Conference; Oak Ridge, Tennessee; October 26, 1972.

MILITARY STATUS

1944 to 1946 Veteran — U. S. Army Signal Corps

TECHNICAL SOCIETIES

Registered Professional Engineer, State of Tennessee

Member of Tennessee Society of Professional Engineers and the National Society of Professional Engineers

PERSONAL

U. S. Citizen
Married
Height — 5'9"
Excellent Health

Born July 12, 1925
Two Children
Weight — 155 pounds
No Physical Defects

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WILLIAM H. RAY
USAEC, Bethesda, Maryland

EDUCATION

BA — Physics — State University of Iowa — 1938

EXPERIENCE

1962 to present — Senior Health Physicist — Fuels & Materials Div. Regulatory, USAEC

Evaluation of the radiological safety provisions of irradiated fuel and radioisotope processing plants. Work has included the preparation of environmental statements, safety evaluations to justify the issuance of materials licenses for: laboratories utilizing hot cells, tests and usage of devices employing large quantities of radioisotopes as a heat source, and containers for the shipment of irradiated nuclear fuel and/or large quantities of radioisotopes.

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1956 to 1962 — Health Physicist — General Atomic

Organized and administered a health and safety program for the newly founded General Atomics Division of General Dynamics. Developed instruments as they became needed for special radiological safety applications, e.g., a stack gas beta activity monitor, a low background laboratory counter to simultaneously measure alpha and beta activity, and a variety of radiation alarms, some adapated to dealing with pulses from accelerators and thermonuclear experiments. Responsibilities included nuclear safety surveillance and material accountability, design of ventilation systems to control airborne radioactive particulates, operation of the radioactive waste collection and packaging service, and promulgation of radiological and industrial safety throughout the laboratory. Served as a member of the iso-

tope committee of a local hospital staff comprised the Radiological Assistance Team for San Diego county.

1955 to 1956 — Training Officer — U. S. Public Health

Conducted Radiological Safety courses for State Health Departments throughout the U. S. Helped to establish the fallout monitoring network, and worked with the Federal Civil Defense Agency in the initiation of a radiological safety training program, which included the forecasting of fallout patterns.

1954 to 1955 — Maintenance Engineer — Black Hawk Broadcasting

Installed, maintained and operated two television stations, and maintained two AM broadcast stations. Ran RCC proof of performance. Designed and built equipment to convert to color transmission.

1950 to 1952 — Research Associate — Graduate School of Public Health, Univ. of Pittsburgh

Taught Radiological Physics and Health Physics, and provided health physics surveillance throughout the University of Pittsburgh and Carnegie Institute of Technology. Initiated a reasearch program to investigate the consequences of inhaling insoluble radioactive particulates. Served as a consultant to Westinghouse Electric Corporation's Atomic Power Division, and participated in Los Alamos Scientific Laboratory fallout studies in Nevada during two bomb test series.

1953 to 1954 — Engineer — Edgerton, Germeshauser & Grier

Responsible for the radiological safety program of EG&G, Inc. in addition to primary duties involving nuclear explosion diagnostic. During this period, developed and field tested a radiation measuring and telemetry system.

1944 to 1950 — Section Chief — Oak Ridge National Lab

Responsible for: all plant and environmental surveys, personnel monitoring, and instrument calibration. Played a primary role in establishing the objectives, developing the techniques, and evolving the basic principles of the health physics profession. Instituted radiological safety programs at the University of Chicago Metallurgical Laboratory, at Mound Laboratory, and at the San Francisco Navl Shipyard (which evolved into the U. S. Naval Radiological Defense Laboratory). Served as a consultant to AEC regarding radiological safety practices at uranium refineries, and made a field study of the residual activity and the particulate problem at Eniwetok, following the first test series at that atoll.

1941 to 1944 — Crystal Physicist — Collins Radio Co.

Developed new quartz oscillator control cuts, manufactured techniques and quality control procedures. Custom finished crystals and trained finishers.

1938 to 1941 — Heating & Air Conditioning Engineer — Checker Electric Supply, Inc.

Surveyed domestic and commercial buildings to determine heating and cooling needs. Designed heating and air conditioning systems, including duct work details. Supervised installations and responsible for attaining warranty performance.

PUBLICATIONS

"Letter to the Editor," (Concerning evidence of log-normal distribution of air sampling data and of personnel cumulative radiation exposure.) Health Physics, Vol. 9, p. 242, 1963.

"Stack Gas Beta Monitor," American Industrial Hygiene Association Journal, Vol. 23, pp. 496-502, 1962.

"Radiation Alarm Pedestal," American Industrial Hygiene Association Journal, Vol. 22, pp. 494-496, 1961.

"Protection of Livestock from Radioactive Fallout," Bremer County Independent, Waverly, Iowa, November 7, 1956.

AECU-565 "The Design of Radiochemical Laboratories."

AECD-2357 "Change and Eng. in Use."

MDDC-1502 "The Clinton Walkie Talkie and Scale of Two."

MDDC-40 "Health Physics Building Surveying at Clinton Laboratory."

Radiological Safety Manuals:

"A Manual of Radiological Safety Practices," The Donald N. Sharp Memorial Hospital, San Diego, California, 1959.

GA-417 "Radiological Safety at General Atomic," 1958.

"Health Physics Primer," Edgerton Germeshausen and Grier, Inc., Las Vegas, Nevada, 1953.

RALPH G. PAGE
USAEC, Bethesda, Md.

EDUCATION

B.A.	Chemistry and Math	Augustana College Rock Island, Ill.	1949-50 1951-54
	AEC Radiological Physics Fellowship	University of Washington Seattle, Wash.	1954-55
	Nuclear Engineering	University of Tennessee University of Maryland	Night School 1957-60
	Management	Federal Executive Inst. Charlottesville, Va.	8 weeks 1969

EXPERIENCE

1972 to present	Chief, Materials & Plant Protection Branch	U. S. Atomic Energy Commission Directorate of Licensing Washington, D. C.

Reviews applicant's materials security and plant protection procedures and issues license amendments, exemptions, and special conditions; assists in development of regulatory materials and plant protection policies and implementing regulations; evaluates effectiveness of applicable materials and plant protection requirements on a continuing basis.

1967 to 1972	Assistant Director for Licensing and Regulations	U. S. Atomic Energy Commission Division of Nuclear Materials Safeguards Washington, D. C.

Same as in present position.

1962 to 1967	Chief, Enforcement Branch	U. S. Atomic Energy Commission Division of Licensing and Regulation Washington, D. C.	

Reviewed compliance inspection reports and initiated enforcement actions in cases where licensees were found out of compliance with applicable regulatory requirements.

1955-1962	Health Physicist	U. S. Atomic Energy Commission Oak Ridge, Tennessee and Washington, D. C.	

Reviewed adequacy of radiation safety programs proposed and implemented by licensees for protecting the public against radiation hazards.

PUBLICATIONS

"Physical Protection of Special Nuclear Material in Transit", Conf. Transportation of Radioactive Material, University of Virginia, Charlottesville, October 1969 by Page, R. G.

"The Division of Nuclear Materials Safeguards — The Second Year", 11th Annual Meeting of Institute of Nuclear Materials Management, Gatlinburg, May 1970 by D'Amico, V. J., and Page, R. G.

"U. S. Safeguards Experience in Regulation and Inspection of the Private Nuclear Industry", Symposium on Safeguards Techniques, Karlsruhe, West Germany, July, 1972 by Wischow, R. P., D'Amico, V. J. Page, R. G., and Ong, L. D. Y.

NATHAN BASSIN
USAEC, Bethesda, Md.
Telephone 301-973-7463

EDUCATION

B.A.	Chemistry	Suffolk University	1951
	Chemistry	Boston College	1956

EXPERIENCE

1958 to date	Senior Reviewer	Materials Branch Directorate of Licensing, USAEC	

Evaluation of applications for use of byproduct material. Review of applications for all areas of radioisotope use including review of applications for disposal of radioactive waste by land burial and burial at sea.

1958-1959	Reviewer	Materials Branch USAEC Division of Licensing and Regulation	

Evaluation of applications for use of byproduct material.

1958	Physical Scientist	Canoga Park Area Office USAEC	

Administration of contract of prime AEC-contractor. Review of health physics and materials management programs of contractor.

1955-1958	Reviewer	Isotopes Branch Oak Ridge Operations Office USAEC	

Review of applications for use of byproduct material.

1952-1954	Chemist	Tracerlab, Inc. Boston, Mass.	

Worked on classified Air Force project.

JACK E. ROTHFLEISCH
USAEC, Bethesda, Md.

EDUCATION

B.Ch.E.	Chemical Engineering	College of the City of N.Y.	1940
	Industrial Management	University of Tennessee	1956-60

EXPERIENCE

1972 to present — Senior Materials Licensing Engineer — U.S. Atomic Energy Commission, Washington, D.C.

Process license applications for uranium milling and uranium hexafluoride production facilities including preparing detailed statements of environmental impact of proposed or existing installations.

1968 to 1972 — Technical Superintendent — Union Carbide Corp., Vanadium Mine and Mill, Hot Springs, Arkansas

Supervised Technical Department Operations. Prepared budget. Established mill operating conditions for optimum recovery of vanadium from ore. Directed studies for solution of process problems, process improvement, and process development. Set up and directed air, water, and noise pollution control programs.

1962 to 1968 — Senior Development Engineer — Union Carbide Corp., Electronics Division, Parma, Ohio

Development and optimization of systems for production of pure hydrogen for use in fuel cells. Studies included catalytic steam reforming processes, thermal cracking of hydrocarbons, dissociation of ammonia, and hydrazine and hydrolysis of metal hydrides. Planned and directed experimental work, correlated test data, prepared reports, and technical proposals for government contracts.

1960 to 1962 — Chief Metallurgist — Union Carbide Corp., Uranium Mill, Rifle, Colorado

Planned and supervised process studies directed toward improved quality and reduced costs in the production of uranium and vanadium compounds from carnotite ore. Responsibilities included supervision of air and water pollution control programs.

1952 to 1960 — Senior Chemical Engineer — Union Carbide Nuclear Co., Gaseous Diffusion Plant, Oak Ridge, Tennessee

Headed section engaged in engineering development studies directed toward improving various processes associated with the separation of uranium isotopes by gaseous diffusion. Process studies included fluorine generation, feed plant operations, byproduct recovery, barrier manufacture.

1951 to 1952 — Lieutenant, USNR — United States Navy

Communications Officer USS Eldorado (AGC-11)

1946 to 1950 — Chemical Engineer III — Tennessee Valley Authority, Chemical Engineering Department, Wilson Dam, Alabama

Pilot and production scale studies in support of production of phosphatic fertilizers, ammonia, nitric acid and ammonium nitrate. Included studies on control of stack emissions from phosphate and nitric acid plants.

1943 to 1946	Ensign, Lieutenant (JG) USNR	United States Navy
	Communications, Executive, Commanding Officer, USS LST 544.	
1941 to 1943	Junior Chemical Engineer	Tennessee Valley Authority Chemical Engineering Department Wilson Dam, Alabama
	Manufacture of water gas conversion and ammonia synthesis catalysts. Ammonia plant start-up.	
1941	Rodman - Chainman	Civil Aeronautics Administration New York, New York
	Airport layout and design	

PUBLICATIONS

"Hydrogen from Methanol for Fuel Cells" SAE, 1964.

"Miniature Hydrogen Generators" Power Sources Conference, 20th Annual Proceedings, 1966.

JAMES C. MALARO, JR.
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Telephone: 973-7718 (Work)
530-5472 (Home)

EDUCATION

1952-1956	College: Major: Degree: Date of Graduation:	Yale University Chemical Engineering B.E. June 1956
1961-1962	One year of graduate study at the University of California (Berkeley) under a U.S. Atomic Energy Commission special fellowship in Health Physics.	

EXPERIENCE

June 1956-May 1959	Process Engineer U.S. Rubber Company, (Naugatuck Chemical Division, Naugatuck, Conn.)
May 1959-May 1961	In military service — served for nineteen months as Health Physicist for the U.S. Army Radioactive Material Disposal Facility (Edgewood, Md.).
Sept. 1962-Dec. 1966	Health Physicist U.S. Naval Research Laboratory.

Dec. 1966-Present — U.S. Atomic Energy Commission:

1. Senior Reviewer, Isotopes Branch, Division of Materials Licensing (Dec. 1966-May 1970).
2. Assistant Chief, Materials Branch, Division of Materials Licensing (May 1970 — March 1972).
3. Chief, Materials Branch, Directorate of Licensing (March 1972 — present).

PROFESSION SOCIETIES

Member of Health Physics Society (President, Baltimore — Washington Chapter) and American Nuclear Society.

Certified by the American Board of Health Physics.

CHARLES E. MACDONALD
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

EDUCATION

B.S. — U.S. Merchant Marine Academy — 1956

EXPERIENCE

1972 to date — Chief, Transportation Branch
Directorate of Licensing
U.S. Atomic Energy Commission

Supervises the review and processing of all types of license applications for and communications concerning the transportation and packaging or radioactive material.

1963 to 1972 — Materials Licensing Engineer
U.S. Atomic Energy Commission

Review and process for final action applications for and communications concerning licenses for receipt, possession, use and transfer of special nuclear material and source material with particular emphasis on those applications for packaging of radioactive material for transport.

1960 to 1963 — Supervisor, Health Physics, Combustion Engineering, Inc., Naval Reactors Division.

Established procedures covering personnel monitoring, waste disposal, environmental monitoring, building and area surveys for operation of the SIC prototype.

1958 to 1960	Radiological Safety, Combustion Engineering, Inc., Naval Reactors Division. Assisted in establishing procedures for the group.	
1958 to 1958	Engineer, Combustion Engineering, Inc., Nuclear Division. Mechanical design of a PWR.	
1956 to 1958	U.S. Navy	

PUBLICATIONS

Implementation of the NEW AEC Transport Regulations 10 CFR 71, co-author, 1968.

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LELAND C. ROUSE
USAEC, Bethesda, Md.
301/973-7457

EDUCATION

B.A.	Physical Sciences, Education	Nebr. State College at Wayne	1951

EXPERIENCE

1972 to present	Chief, Technical Support Branch	Fuels and Materials Directorate of Licensing

Responsible for administration and technical direction of Branch functions to provide technical support in connection with the AEC's licensing program for fuels and materials activities; primary efforts are concerned with the safety and environmental aspects of fuel fabrication plants and fuel reprocessing facilities. Prepare environmental statements for these type of facilities, and provide technical assistance in specialized areas in the safety evaluation of license applications. Assist in the development of related guides, standards and technical specifications.

1965 to 1972	Sr. Materials Licensing Engineer	Division of Materials Licensing, USAEC

Reviewed and evaluated for final action license applications for possession and use of source and special nuclear material. Major effort was concerned with evaluation of radiation safety aspects of fuel fabrication plants.

1963 to 1965	Radiation Specialist	Div. of Compliance Region IV, USAEC

Inspected and appraised the radiation safety programs of AEC licensees to determine status of compliance with AEC regulations and license conditions.

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1960 to 1963	Specialist, Radiological Records	Hanford Atomic Products, General Electric Co.	

Evaluated and directed Hanford radiation records program. Conducted studies to retrieve and use recorded date to detect trends in personnel exposure and protection practices; participated in conduct of personnel dosimetry programs at Hanford.

1956 to 1960 and 1952 to 1954	Specialist, Radiation Monitoring	Hanford Atomic Products General Electric Co.	

Prescribed radiation control and protection requirements for operating personnel at reactors, hot cell facilities, plutonium processing facilities, radiochem research labs and during construction and maintenance operations. (Period from 1954 to 1956, U.S. Army).

1951 to 1952	Tech. Grad. Rotational Trainee	Hanford Atomic Products General Electric Co.	

Accepted position with General Electric Co. at Hanford on rotational training program. Training assignments with production reactor operating group, process analytical chemistry section and a metallurgy research group were completed before accepting a permanent assignment in the Radiation Protection Operation.

SOCIETIES

Health Physics Society; alternate AEC member on ANSI N46 Nuclear Standards Committee (Design, Construction and Operation of Nuclear Fuel Cycle Facilities).

ROBERT J. DUBE
Technical Support Branch
Fuels and Materials

EDUCATION

B.S.	Physics	Bates College	1960
M.S.	Physics	U. of Delaware	1962

Graduate courses in nuclear science and engineering.

		Catholic U.	1968-1972

EXPERIENCE

1970 to date	Nuclear Process Engineer	Directorate of Licensing Fuel Fabrication Branch/ Technical Support Branch

Evaluation and analysis of the radiological safety and environmental protection aspects of license applications and environmental reports for fuel cycle plants including principally fuel fabrication plants. Development of standards and guides.

1964 to 1970	Health Physicist	Division of Materials Licensing Isotopes Branch

Technical evaluation of applications for Byproduct Material Licenses, including research, medical and industrial applications. Assisted in the development of standards and guides.

1963 to 1964	Health Physics Trainee	Brookhaven National Laboratory

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Telephone (301) 973-7427

EDUCATION

B.S.	Chemical Engineering	Rose-Hulman Institute	1958
Ph.D	Nuclear Engineering	University of Maryland	1972

EXPERIENCE

1971 to date	Chemical Engineer	U.S. AEC, Regulation Fuel Fabrication and Reprocessing Branch

Safety Evaluation of nuclear fuel cycle facilities. Review and development of safety standards and criteria for licensing of fuel cycle facilities.

1965 to 1971	Student	University of Maryland
1964 to 1965	Chemical Engineer	U.S. AEC, Regulation Irradiated Fuels Branch

Safety Evaluation of nuclear fuel cycle facilities. Review and development of safety standards and criteria for licensing of fuel cycle facilities.

1962 to 1964	Chemical Engineer	Savannah River Plant

Technical Assistance on fuel receipt and storage. Technical studies of reprocessing operations.

1958 to 1962	Chemical Engineer	Savannah River Laboratory

Development of processes and equipment for application to radiochemical separations plant.

PUBLICATIONS

A Cylindrical Transport Kernel in Heterogeneous Media.
Development of a 10-inch Centrifugal Contactor.

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RICHARD B. CHITWOOD
USAEC, Bethesda, Md.

EDUCATION

BA	Chemistry, Physics & Mathematics	Adams State Alamos, Colo.	1952

EXPERIENCE

1968 to present	Chief, Fuel Fab. & Reprocessing	Fuels & Materials Div. Regulatory, USAEC

Responsible for the analysis and the evaluation of the radiological safety aspects of (1) fuel cycle fabrication and chemical processing plants including those which reprocess irradiated nuclear reactor fuels, (2) hot cell facilities used for research and development and testing of radioactive materials (3) licensing of operators for chemical reprocessing plants. During this period responsibilities have extended to the evaluation of packaging for shipment of large quantities of radioactive material and thermoelectric generators which use large quantities of radioactive material as a source of energy.

1962 to 1968	Inspection Specialist	Compliance Division USAEC

Responsible for conducting nuclear criticality safety inspections and developing the inspection program. Responsible for conducting nuclear criticality safety inspections at all licensed facilities, other than reactors in the United States, having sufficient fissile material to present a potential for accidental nuclear criticality. This included plants engaged in fuel fabrication, chemical conversion, and spent fuel reprocessing. Responsible for developing a program and selecting a staff for conducting such inspections in the expanding industry.

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1955 to 1959	**Process Engineer**	General Electric Hanford Atomic Products Operation	

Process engineer in chemical separation operations and plutonium and uranium production processes. From 1959 until acceptance of an appointment with AEC, responsible for establishing nuclear criticality safety limits and writing procedures for their implementation in a plutonium recovery and fabrication plant; also, was involved in the conduct of numerous "in-plant" neutron multiplication tests and was responsible for developing work on various radiation detection devices including a portable neutron spectrometer.

1952 to 1955		General Electric Hanford Atomic Products Operation	

Involved in nuclear fuel development, fuel fabrication, reactor engineering, reactor operation and various processing activities associated with chemical reprocessing of spent reactor fuel.

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KATHLEEN M. BLACK
USAEC, Bethesda, Maryland

EDUCATION

B.S.	Chemical Engineering	Massachusetts Institute of Technology	1950
M.Ch.E.	Chemical Engineering	New York University	1970
M.B.A.	Finance	New York University	1972

EXPERIENCE

1972 to present	Project Reviewer	USAEC, Directorate of Licensing, Fuels and Materials	

On the staff of the Fuel Fabrication and Reprocessing Branch of Fuels and Materials. Participates in licensing of fuel cycle facilities for fuel fabrication and other types of facilities.

1968 to 1972	Senior Nuclear Engineer	Parsons Jurden Corporation, a Subsidiary of the Ralph M. Parsons Company	

Worked on various projects including quality assurance for an LMFBR conceptual design nuclear-process engineer for a mixed oxide fuel fabrication study; quality assurance consulting; fuel cycle economic studies.

1968	Senior Physicist	Vitro Laboratories	

Studies on nuclear systems.

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1952 to 1968	Senior Nuclear Engineer	Parsons Jurden Corporation, Successor to Vitro Engineering Company	

Nuclear and chemical engineer for a number of facilities including hot laboratories, fuel reprocessing, fuel fabrication pilot plant, deuterium recovery, nuclear power plant, research reactors.

PROFESSIONAL REGISTRATION

Registered Professional Engineer in New York.

MEMBERSHIP

American Institute of Chemical Engineers.

FRANK K. PITTMAN
U.S. Atomic Energy Commission
Washington, D.C. 20545
Telephone 301 973-4285

EDUCATION

B.E.	Chemical Engineering	Vanderbilt Univ.	1936
M.S.	Analytical Chemistry	Vanderbilt Univ.	1937
Ph.D.	Inorganic Chemistry	Mass. Inst. of Tech.	1941

EXPERIENCE

1971 to date — Director, Division of Waste Management and Transportation, U.S. Atomic Energy Commission.

Management of radioactive waste to protect the public and the environment.

1967 to 1971 — Director of Technical Services, Nuclear Division, Kerr-McGee Corp.

Headed all nuclear division technical activities.

1964 to 1967 — Special Assistant to the Corporate Vice President for Marketing, North American Aviation, Inc.

Primarily responsible for corporate activities in the technical and business planning and marketing efforts of the Company's nuclear programs.

1948 to 1964	U.S. Atomic Energy Commission. Various positions, including: Deputy Director, Division of Production, 1948-1954. Deputy Director, Div. of Civilian Applications, 1954-1957. Director, Div. of Industrial Relations, 1957-1958. Director, Div. of Reactor Development, 1958-1964.		
1944 to 1948	Los Alamos Scientific Laboratories. Various responsibilities in the processing, recovery and fabrication of plutonium for the Atomic Bomb Project, culminating in position of Manager of the Plutonium Production Site.		
1943 to 1944	Research Chemist	Cohart Refractories	
1940 to 1943	Instructor of Chemistry	Mass. Inst. of Tech.	

PUBLICATIONS

"Nuclear Power, U.S.A." with Zinn and Hogerton, McGraw-Hill, 1964.
Numerous classified technical papers on plutonium chemistry, 1944-1948.

HOMER LOWENBERG
USAEC, Bethesda, Maryland

EDUCATION

M.E.	Mechanical Engineer with Distinction in Chemical Engineering	Stevens Institute of Technology	1942
	Executive Development	Graduate School of Public and Business Administration, Cornell University	1965

HONORS

Tau Beta Pi	Honorary Engineering Society
Pi Delta Epsilon	Honorary Editorial Society

EXPERIENCE

1972 to present	Technical Assistant for Engineering	USAEC, Directorate of Licensing, Fuels and Materials

On the staff of the Deputy Director for Fuels and Materials. Participates in planning and management of fuel cycle facility licensing activities. Develops engineering criteria, guides, and standards for fuel cycle facilities including U mills, UF_6 Production Plants, fuel fabrication plants, fuel reprocessing plants, and waste disposal facilities.

1967 to 1972	Manager of Central Engineering	Nuclear Materials and Equipment Corporation, subsidiary of Atlantic Richfield Company

Responsible for planning, engineering and construction of all capital programs including new plant construction, facility modifications, equipment upgrading, future facility planning, and site selection for the nuclear program of this world-wide petroleum organization.

1948 to 1967 — Manager of Operations, New York — Vitro Engineering Company (Formerly The Kellex Corporation)

Responsible for the integrated activities of this architect-engineer-construction organization that handled many unique Government and Industry projects including over three dozen nuclear programs that covered a wide spectrum of applications involving nuclear power, nuclear fuel cycle processing, nuclear propulsion, and research and development.

PROFESSIONAL ACHIEVEMENTS

Professional Engineer in states of New York and Pennsylvania.

Engineering experience spans more than 30 years including 25 years of demonstrated performance in nuclear engineering. Responsible for the design and construction of more than 100 facilities including 40 nuclear projects valued at over $900 million.

Member of American Nuclear Society.

S. H. SMILEY
Deputy Director for Fuels and Materials
Directorate of Licensing
U. S. Atomic Energy Commission

EDUCATION

New York University (University Heights)

B.A. Chemistry	1941
M.S. Chemistry	1943

HONORS, AWARDS, AND FELLOWSHIPS

Phi Lambda Upsilon; Sigma XI (RESA)

Fellow: American Institute of Chemists

EXPERIENCE

Nov. 1971-Present — Deputy Director for Fuels and Materials (formerly the Division of Materials Licensing), Directorate of Licensing.

Responsible for administering the AEC's licensing program for construction and operation of fuel cycle plants including uranium mills, UF_6 plants, uranium and plutonium processing and fabrication plants, fuel reprocessing plants and waste disposal facilities. Also responsible for authorizing the domestic use and export of byproduct source and special nuclear materials, licensing the packaging of radioactive materials for transport, inclusion of safeguards provisions in nuclear material licenses and the administration of the AEC's program for cooperation with the States. An important aspect of the work of the Fuels and Materials staff is the preparation of environmental statements.

1967-1971 Manager, Research and Development, NUMEC.

Reporting to the President, had responsibility for a broad range of activities covering the spectrum from basic research to pilot plant operations and developmental production operations, including corporate management responsibility for health, safety and licensing. Activities encompassed nuclear fuels process and equipment development on Pu, U and Th compounds.

Principal activities included:

—Nuclear fuels process and equipment development on plutonium, uranium and thorium compounds, covering laboratory, bench and pilot scale operations. Managed multimillion dollar LMFBR R&D program including successful prequalification effort for the FFTF.

—Inorganic chemistry development in such specialized areas as refractory coatings, plasma sythesis, spheroidizing, and sol-gel technology.

—A broad research and development effort associated with Atlantic Richfield's spent nuclear fuels reprocessing program.

—R&D including contract research and contract operations associated with uranium and plutonium scrap recovery.

—Metallurgical development, especially associated with nuclear fuels but including powder metallurgy and powder metal products development for the aircraft and aerospace industries.

—Irradiation processes and product development—synthesis by gamma irradiation.

—Technical support of development work in connection with thermal and thermionic devices, including the nuclear powered cardiac pacemaker.

—Operations analysis and planning associated with research and development activities, including relationship of R&D to the rest of the corporation.

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—Responsibility for the Health and Safety and Licensing activities of the company, including dealing with the AEC and other outside agencies.

—Participation in corporate long-range planning.

1945-1967 Superintendent, Engineering Development, Gaseous Diffusion Plant, Union Carbide Corporation, Oak Ridge, Tennessee.

Specific major accomplishments at Oak Ridge include the following:

1. Initiated and directed all major programs associated with the development of continuous processes for uranium tetrafluoride and uranium hexafluoride manufacture at the Oak Ridge Gaseous Diffusion Plant (K-25). Had considerable contact with other AEC sites and commercial activities. Also directed a special research and development program on direct processing of ore concentrates to uranium hexafluoride.
2. Directed research and development associated with the conversion of uranium hexafluoride to uranium tetrafluoride, uranyl fluoride, and uranium dioxide by continuous, efficient processes.
3. Made important contributions to gas-solid contactor and flame reactor technologies. Specifically, was involved in developing the fluid bed as a reactor to convert the bed solid; also, along with colleagues, developed the stirred fluid bed as a chemical reactor. Holds the basic patent on the hydrogen-fluorine flame reactor for reduction of uranium hexafluoride.
4. Issued patent on flame reactor process to convert refractory metal or alloy powders with unusual properties.
5. Directed numerous other Oak Ridge programs: e.g., removal of trace impurities from uranium hexafluoride by sorption techniques; solvent extraction recovery of uranium; synthesis of inorganic fluorides, e.g., rhenium hexafluoride; tungsten hexafluoride; removal or uranium hexafluoride from a gas

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stream by various techniques; boron isotope separation and boron production; chemical vapor deposition of tungsten, nickel. Established design criteria for construction of a Kel-F fluorinated plastics production plant; was responsible for management and program direction of a Kel-F fabrication development laboratory — here, some of the initial work on extrusion of tubing as well as transfer and injection molding was carried out.

6. Was a key member of the technical and management team that developed the uranium isotopes separation barrier — made significant technical and managerial contributions to programs associated with diffuser development and performance as well as those programs involving diffusion cascade auxiliary components, e.g., water recirculation systems, uranium hexafluoride trapping systems, fluorine and uranium hexafluoride disposal and recovery systems, etc.

7. Started and managed a major program on spent fuel reprocessing at K-25. The program also included development of a process to separate and to package radioactive krypton and xenon from fuel reprocesssing plant off-gases — using a freon solvent stripping and concentration system.

8. Initiated and managed a significant experimental and semi-production program, involving plasma torches and their use over a broad application base.

9. Authored numerous reports, many of which are on gaseous diffusion, particularly the separation membrane (barrier) and are classified. A few examples of unclassified publications dealing with uranium and fluorine technology are:

   a. Several chapters for the Pergamon Press Progress in *Nuclear Energy Series,* including an 87-page critical review, "Gas-Solids Reactors in Uranium Processing," *Progress in Nuclear Energy,* Series IV, Vol. 4 Technology, Engineering and Safety, 1961.

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   b. CEP Symposium Series, *Nuclear Engineering,* Part XV, "Nuclear Plant Experience with Fluidized Beds."

   c. S. H. Smiley, D. C. Brater, C. C. Littlefield, and J. H. Pashley, "The Important Role of Elemental Fluorine in Uranium Processing Operations," Presented at the 1960 Fall Meeting of ACS, New York, New York, September 1960.

   d. S. H. Smiley, D. C. Brater and H. L. Kaufman, "Preparation of Refractory Metal Powders with Unusual Properties," Journal of Metals (June 1965), presented at the National AIME Meeting, Chicago, Illinois, February 1965.

   e. S. H. Smiley, "A Summary of Progress by Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee", Tungsten and Tungsten Alloy Tubing Development Meeting, Germantown AEC Headquarters, Washington, D. C., May 26, 1966.

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   f. S. H. Smiley, "The Future Use of Fluorine and Fluorides in the Nuclear Chemistry, Introductory Comments by the Chairman, presented at the 152nd National ACS Meeting, New York, September 1966.

   g. "Flame Reduction of Volatile Inorganic Fluorides to Produce Pure Refractory Metal and Alloy Powders," presented at the Third International Symposium on Flourine Chemistry, August 30-September 2, 1965, Munich, Germany.

   h. "Fluid-Bed Volatility Component, Engineering Feasibility, and Scale-Up Studies at the Oak Ridge Gaseous Diffusion Plant," presented at the XXXVI International Congress on Industrial Chemistry, September 1966, Brussels, Belgium.

1944-1945	Group Leader, Uranium and Fluorine Technology and Barrier Development, The Kellox Corporation; was involved in technical leader capacity for chemical processing projects, concentrating on UF_6 handling and analytical methods.
1943-1944	Research Chemist, Standard Varnish Works, Staten Island, New York; worked on resin and paint synthesis for improving of properties.
1941-1943	Graduate Assistant (Chemistry Department), New York University; taught undergraduate classes and assisted in undergraduate chemistry laboratories.

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CHAIRMAN PAGLIN: Mr. Murray, you will have copies available for any interested participants?

MR. MURRAY: Mr. Chairman, unfortunately, among all of our other copying activities, we neglected to make a great deal of copies for other people. We have a few. Of course, they will be in the public record.

CHAIRMAN PAGLIN: I was going to say, Mr. Murray, should anyone have any questions about the qualifications of the experts appearing on behalf of the Staff, we can loan them our copies.

Thank you. We will proceed. Mr. Smiley.

Excuse me. If there is any difficulty in hearing the witness in the back of the room, please let us know and we will attempt to move the mike closer to him, or try to make it possible so everyone in the room can hear him. Is this PA system working? I get a nod of the heads from the back.

STATEMENT OF S. H. SMILEY, DEPUTY DIRECTOR FOR FUELS AND MATERIALS — DIRECTORATE OF LICENSING, REGULATORY STAFF OF THE ATOMIC ENERGY COMMISSION.

MR. SMILEY: The licensing review of individual nuclear power reactors is governed by 10 CFR Part 50 of the Commission's Regulations. The AEC's policies and procedures for implementing the National Environmental Policy Act of 1969 are set forth in Appendix D to Part 50. Appendix [73] D includes a requirement for a detailed environmental report from the applicant containing a cost-benefit analysis which should, to the fullest extent practicable, quantify and balance the various environmental, eco-

nomic, technical, and other factors involved in each proposed facility.

On November 15, 1972, the Atomic Energy Commission published for comment in the Federal Register a notice that it is considering possible amendments to Appendix D to deal specifically with how environmental effects associated with the uranium fuel cycle are to be considered in the cost-benefit analyses for individual light water-cooled nuclear power reactors.

The technical support for the amendments is contained in a document entitled, "Environmental Survey of the Nuclear Fuel Cycle." The survey sets forth the off-site environmental effects of the nuclear fuel cycle for today's reactors, which are uranium dioxide fueled and light water-cooled, and is prepared so that the fuel cycle environmental effects attributable to a single reactor can be evaluated. The survey covers the environmental effects of the various steps in the uranium fuel cycle which include uranium mining and milling, production of uranium hexafluoride, encirhment of the uranium in the isotope uranium-235, fabrication of reactor fuel elements, chemical processing of spent fuel to obtain reusable fuel material, management of radioactive wastes, [74] and transportation.

The following conditions were borne in mind in developing the premises for the survey:

(1) Each facility within the different components of the fuel cycle (except uranium mining which is under the jurisdiction of the U. S. Bureau of Mines) is or will be the subject of detailed AEC safety and environmental reviews in connection with the review of materials or facilities license applications or other federal actions. For example, a Safety Evaluation Report and an Environmental Statement are prepared by the Regulatory Staff in connection with each application to construct and operate a spent fuel reprocessing facility. A safety review is then made by the Advisory Committee on Reactor Safeguards and the application is subject to hearings before an Atomic Safety and Licensing Board.

(2) There are more than 150 nuclear power reactors in operation, under construction, or planned in the United States. Each uranium mining or milling operation, uranium hexafluoride production plant, isotope enrichment facility and fuel element fabrication plant will contribute fuel to a number of these reactors, but there does not appear to be any way to ascertain with certainty which fuel cycle facility will serve a given reactor or other licensed or nonlicensed (i.e., AEC operational) activity, like the isotope separation plant.

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(3) There are a variety of ways of performing most of the steps in the nuclear fuel cycle.

In recognition of the above points, the following decisions were reached regarding the approach and content of the survey:

(1) The survey was based on a "model" 1,000 megawatt electrical light water-cooled power reactor using uranium dioxide fuel and having an estimated useful life of 30 years. The annual fuel requirement for this "model" reactor was taken to be an average of the amount required for the initial fuel loading plus 29 annual reloads. Recognizing that a typical boiling water reactor and a typical pressurized water reactor may have different annual fuel requirements, the amounts used in calculating the 30-year average were conservatively

taken to be the higher of the two alternatives for each year.

(2) Because for most steps of the fuel cycle a number of plants utilizing a variety of processes and operations are involved, a generic approach was used in assessing the environmental effects of the fuel cycle. For each step of the fuel cycle, a model facility was defined.

For those fuel cycle steps where a single method or type of facility predominates, this method or facility was adopted as the model. For other fuel cycle steps, again in the interests of conservatism, that mode of operation [76] imposing the most significant impact on the environment was in most cases adopted as the model. For certain steps, where only two or three facilities with widely different modes of operation and environmental impacts are involved, the model was based on a weighted averaging of the facilities' throughputs. The model facilities are thus not intended to represent particular plants. Rather, they were defined so as to be representative of the industry, with a conservative bias in assessing environmental impact. Effluent concentrations, radiation dose rates, and human population densities appropriate to the model fuel cycle facilities were then estimated using the best available data from existing or planned facilities.

(3) From a review of operations immediately "upstream" and "downstream" of each fuel cycle facility, only the generation of electrical energy for the isotope enrichment step was judged to cause significant environmental effects. The environmental effects of the coal fired power plants used in the grids supplying the power were therefore included in the survey. These coal fired plants are

the major source of gaseous effluents and use the bulk of the water for the entire fuel cycle.

(4) In each step of the fuel cycle the models were selected to be representative of the industry today with only minimal allowances for future technological advances [77] entailing lesser environmental impacts.

(5) The survey is not intended to relate to any specific site characteristics. Meteorology, hydrology, seismology, historical significance and site ecology are all analyzed in detail by the AEC in connection with its review of license applications for individual fuel cycle facilities.

(6) The survey does not attribute any benefits to the fuel cycle since benefits are credited to the generation of energy at the power plant which the fuel cycle supports.

(7) Occupational health and safety relating to on-site workers is not considered in this environmental survey or in environmental statements or reports. Such consideration is a major factor in the detailed safety reviews that are undertaken by the AEC Regulatory Staff as an integral part of the licensing reviews for individual fuel cycle facilities. Applicants are required to engineer, construct, and operate proposed facilities to limit the exposure of workers to fractions of prescribed low levels of radiation and potentially hazardous conditions. During the operation of the facilities, periodic checks by the AEC Regulatory Operations Staff are carried out to monitor the actual occupational conditions and assure that workers are not exposed to unsafe or hazardous conditions.

(8) Fuel cycles alternative to the uranium dioxide [78]
cycle have not been considered since the light water re-

actors that are the subject of the proposed rulemaking are not at this time using any other form of fuel. In the future, some or all of these reactors may use uranium-plutonium mixed oxide fuel. At that time, we would expect that a similar generic survey would address the environmental effects associated with the use of that fuel.

Each component of the fuel cycle was analyzed for off-site environmental effects in a manner similar to the Commission's methods of assessing Environmental Impacts for Nuclear Power Plants, and encompassed: Natural resource uses including land, water, and fossil fuel; effluents including radiological, chemical, and thermal; accident considertions; and transportation of radiological materials.

The results of these analyses have been normalized to the annual fuel requirements of the model LWR and are summarized in Tables 3 and 3-A of the Environmental Survey. To place the resultant data in perspective, comparisons have been made with the environmental impacts caused by operations of comparable magnitude in other industries, and with the requirements laid down in various federal, state, and other regulations and standards.

The findings of the survey are summarized as follows:

Use of Resources

[79]

(1) Land

In meeting the annual fuel requirement for the model reactor, about 63 acres of land are temporarily withdrawn from active human use. The fencing required also restricts migration of large animals. Approximately 18 acres are transformed from their original state by the construction of facilities. This disturbed area is less than 10 percent of the equivalent annual commitment for coal mining for a 1000 MWE coal fired power plant. Less than five acres of

land are permanently committed to the production of the annual fuel requirement for the model reactor.

(2) Water

Approximately 11.3 billion gallons of water are moved in producing the annual fuel requirements for the model LWR. Eleven billion gallons of this is required to remove the waste heat from the coal fired power stations supplying electrical energy to the enrichment facility. Assuming once-through cooling at these power stations, all of this water is returned to surface water bodies. The remaining 338 million gallons is required for cooling, processing, and dewatering at other fuel cycle plants. The total of 11.3 billion gallons required for the entire nuclear fuel cycle represents less than 4 percent of the water requirement (approximately 300-400 billion gallons/year) of a 1000 megawatt electric light water reactor utilizing once-through

[80]

cooling.

(3) Electricity

The total electrical requirements to meet the annual fuel requirement of the model reactor are 317 thousand megawatt-hours, which is less than 5 percent of the energy (seven million megawatt-hours) which the reactor would produce in a year's operation. Over 98 percent of the electrical energy required by the fuel cycle as a whole is utilized in the enrichment step.

(4) Natural gas

Approximately 100 million standard cubic feet (scf) of natural gas are consumed to produce process heat. Most of this is used in the milling operation. This quantity of natural gas could be used to generate roughly 10,000 megawatt-hours of electricity, which is less than 0.2 percent of the annual output of the model reactor.

Effluents

(1) Chemical

(a) Gaseous

Assuming that the electricity requirements of the fuel cycle facilities are supplies by coal fired power stations, the combustion products of coal would comprise nearly all of the airborne chemical effluents attributable to the nuclear fuel cycle. Since the uranium enrichment step consumes over 98 percent of the electrical energy required **[81]** by the fuel cycle, these gaseous effluents are ascribed to this step. To the extent that power is supplied by nuclear power plants, the total quantity of sulfur dioxide, nitrogen oxides, hydrocarbons, carbon monoxide, and airborne particulates would be greatly reduced.

Fluorine is introduced into the fuel cycle for the production of uranium hexafluoride and is removed from the fuel material in the fuel fabrication step. Fluorine thus becomes an airbore effluent from several steps of the nuclear fuel cycle. Although most of the fluorine gaseous wastes are effectively removed by scrubber treatment systems, approximately 0.7 metric ton is released to the environment as an airborne contaminant in supplying the annual fuel needs of the model reactor. To put this quantity into perspective, the estimated fluoride release from the total nuclear industry in 1980 assuming an installed nuclear generating capacity of 140,000 megawatts, electrical, would be less than 0.1 percent of the total fluoride released from four other basic industries: phosphates, aluminum, steel, and ceramics.

Measurements or calculations of airborne fluoride concentrations at the site boundaries of specific plants in the nuclear fuel cycle are well below the levels observed to have

an adverse effect on human health, and are well within the amounts permitted by existing state standards. State standards are used for comparison because there are no **[82]**
applicable federal standards.

At uranium mills and uranium hexafluoride production plants, the combustion of natural gas for process heat releases nitrogen oxide to the environment. Dispersion calculations show that annual mean concentrations of nitrogen oxides from this source are within the 100 micrograms per cubic meter established as the limit in Environmental Protection Agency air quality standards. That standard is intended by EPA to protect the public from any known or anticipated adverse effects associated with the presence of oxides of nitrogen in ambient air.

CHAIRMAN PAGLIN: Mr. Smiley, may I just interrupt you for a minute. I apologize for the gentlemen standing in the back. I understand that chairs will be brought in very shortly, so if you will just bear with us, we will have enough chairs to go around.

Would you continue, please, Mr. Smiley.

MR. SMILEY: I have just completed discussing the gaseous chemical effluents. Now I would like to comment on the liquid effluents.

The largest quantity of liquid effluents, 240 thousand metric tons of waste solutions per annual fuel requirement of the model reactor, comes from the milling processes. This waste is discharged to the tailings pond, and since it does not normally contaminate unrestricted **[83]** ground or surface bodies of water, it does not actually become an effluent stream.

The concentrations of fluorides, nitrates, and ammonia contained in the liquid waste streams from fuel fabrication plants are a possible source of adverse environmental effect. Dilution of these constituents by the receiving body of water by factors ranging from 10 to 1000 may be required to achieve drinking water source quality. The dilution factor needed depends on the flow rate of the receiving body, its upstream quality and its downstream use. Efforts are in progress to minimize these releases from existing fabrication plants. Normally, sufficient dilution is easily achieved.

(c) Solid wastes, non-radiological.

The greatest bulk of solid wastes is generated in open pit uranium mining and milling operations. The barren rock and earth which, in open pit mining, must be removed to reach the minable ore constitutes a waste material only temporarily, since it is returned to the barren mine as backfill. The major source of solid waste in the uranium fuel cycle is the mill tailings, composed primarily of sandstone and clays. Some 91,000 metric tons of such wastes can be attributed to the annual fuel requirements of the model reactor. They are pumped as a slurry to the tailings pond, where they are permanently stored as solids in a chemical
[84]
form similar to their original condition, but containing slightly less radioactivity since uranium has been removed.

(2) Radiological

(a) Gaseous

The most significant gaseous radiological releases occur in the fuel reprocessing step. Nearly all of the krypton-85, most of the tritium, and minute quantities of radioiodine, other fission products, and transuranic particulates created

in the nuclear reactor fuel are released to the atmosphere from the reprocessing plant operations.

The annual 50-mile population dose from reprocessing operations attributable to the annual fuel requirements of the model reactor is estimated to be 4.4 man-rem, or about 0.005 percent of natural background radiation.

Small quantities of uranium and its daughters are released to the atmosphere in several steps of the fuel cycle. Measurements of radon presence in an open-pit mine revealed no significant alpha concentrations. The site boundary concentration of thorium-230 from the model mill producing the fuel requirements for about five model reactors is estimated to be approximately 15 percent of the amounts permitted by AEC regulations (10 CFR 20). In all other cases the concentrations of uranium and its daughters are estimated to range from 1-4 percent of the AEC limits for unrestricted areas.

[85]

(b) Liquid

In the fuel reprocessing for the model reactor's annual fuel requirement, approximately 2500 curies of tritium and 4 curries of ruthenium-106 are released in the liquid effluent from the model reprocessing plant. Because of the effect of dilution in receiving streams, measurements in 1971 indicated that the maximum off-site concentration of each species was less than 4 percent of the 10 CFR 20 limits.

Small quantities of uranium and its daughters are released in liquid effluents from each step of the fuel cycle. Estimates of the concentrations of radionuclides in effluent streams from fuel cycle plants indicate that concentrations are from 1 percent to below 10 percent of the 10 CFR 20 limits before dilution in receiving waters.

(c) Solid

The most significant solid radiological waste consists of the fission products separated from spent fuel in the reprocessing operation. These high-level wastes will be stored on-site for a maximum of 10 years, and will ultimately be shipped, probably by rail, to a federal storage facility. This federal facility will store and manage high-level solid wastes under constant surveillance for up to 100 years, or until such time as a more permanent federal repositary can be established. The storage facility will be designed to prevent the release of any radioactive material [86] to the environment by any credible environmental condition or human action. Dr. Frank Pittman, Director of the AEC Division of Waste Management and Transportation, will present further testimony regarding the AEC program for safe handling of high level waste.

Fuel element hulls and other fuel element parts contaminated with trace quantities of uranium, transuranics and fission products will be buried on-site at the reprocessing facility in a retrievable form. Other slightly radioactive material, such as laboratory wastes, may be buried on-site or at a commercial burial ground.

Wastes from uranium hexafluoride production facilities and fuel fabrication plants amount to a few curies per annual fuel requirement for the model reactor and are packaged and shipped by truck to a licensed commercial burial site. The geological and hydrological characteristics of these burial sites are such that there will be little or no migration of radioactive material from the site. The burial sites are enclosed by fences and access is controlled.

The solid waste tailings from the milling operations, which contain most of the uranium daughter products originally in the ore, are pumped to the tailings retention pond and the activity is contained on-site.

(3) Thermal

Approximately 3.4 trillion Btu of waste heat are [87] discharged to the biosphere in fuel cycle steps meeting the model reactor's annual fuel requirements. About 95 percent of this comes from the isotope enrichment step. For purposes of comparison, the waste heat from the annual operation of the model reactor itself is approximately 50 trillion Btu. Thus, the thermal releases from the supporting fuel cycle constitute less than 7 percent of the thermal release from the model reactor.

Accident Considerations

The history of the nuclear fuel cycle to date indicates that accidents in fuel cycle facilities which could result in significant effects on the off-site environment are highly improbable. This record of the commercial nuclear fuel cycle industry has been accomplished by establishing safety as a controlling factor in all operations.

Each applicant is required in his license application to analyze potential conditions that could result in the release of radioactivity beyond the plant confines. He is further required, by proper design, construction and operation, which are carried out under quality assurance programs, to minimize the possibility of such releases. As a further assurance, the AEC makes a detailed independent safety evaluation of each commercial fuel cycle facility. This evaluation includes at least the following elements:

[88]

(1) *Site Analysis* — The geography, meteorology, hydrology, and other characteristics of the site are re-

viewed. In addition, severe natural phenomena pertinent to the site are taken into account in evaluating the design of plutonium and reprocessing plants.

(2) *Process Evaluation* — The process flow sheet is reviewed in detail to identify potential effluents and safety problems during normal and abnormal operations.

(3) *Structures, Systems, and Equipment* — The building itself, including significant features such as modules, layouts, corridors and points of access and egress, is reviewed for safety, emergency escape, limiting the spread of contamination and prevention and control of fires.

Ventilation, air cleaning, waste treatment, safety instrumentation and monitoring systems are analyzed for suitability under normal and abnormal conditions.

Process and utility equipment are reviewed for adequacy and reliability.

(4) *Safety Programs* — Among the safety programs reviewed are those involving contamination control, ventilation system performance, exposure assessment for workers and control of such exposure. Effluents and effluent treatment and monitoring systems for both liquid and gaseous streams leaving the plant are evaluated. Accident analyses that include consideration of criticality, radiation safety, **[89]** and nonradiation safety problems are performed. In plants handling special nuclear material, both liquid and solid systems are evaluated for criticality safety.

(5) *Procedures* — Each licensee is required to have detailed operating and maintenance procedures reinforced by quality assurance programs. The training and

testing programs for operators are reviewed. Particular attention is given to fuel reprocessing plant operators, each of whom must be tested and licensed by the AEC. The licensee must have in being a hazard review committee or some similar organization that has responsibility for review of new processes and plant changes.

And I might mention these committees must meet regularly.

The licensee must also perform safety audits of operations and report the results to the AEC. License applicants must submit plans for coping with emergency situations. The AEC reviews these plans in detail. Emergency plans required for plants handling special nuclear material are spelled out in conditions attached to the license. Emergency plans required for fuel reprocessing plants are specified in Appendix E of 10 CFR 50.

(6) *Materials and Plant Protection Evaluation* — The AEC reviews in detail each applicant's program for safeguarding special nuclear material against theft, diversion, or **[90]** sabotage.

As a supplement to requirements for care in design, construction, and operations of nuclear fuel cycle facilities, each licensee is required to report to the cognizant AEC Regulatory Operations office any incidents which cause or threaten to cause unexpected events covered by AEC Regulations. The information in these reports is used as a basis for corrective action to prevent similar events from occurring in other plants and is taken into account in the licensing reviews on new or modified facilities of a similar nature. Such information is also evaluated to determine the need for new or modified standards.

The effectiveness of these measures is demonstrated by the fact that there have been no incidents in fuel cycle facilities using slightly enriched uranium in this country which have resulted in significant injury to or endangered the health of any individual in the general public. Nevertheless, for each fuel cycle facility requiring an AEC license, a series of potential accidents with environmental effects judged to range from trivial to serious is postulated and evaluated in the safety analysis performed before the individual facility license is issued.

Records to date indicate few, if any, of the routine type accidents involving special nuclear material have had any measurable effect on the environment. Thus, the review [91]
of accidents for this "Environmental Survey of the Nuclear Fuel Cycle" have been concentrated upon the most serious accidents that either have occurred or that can realistically be postulated. The estimated radiation exposures in unrestricted areas resulting from the most significant of these accidents are summarized in Table S-5 of the survey.

Transportation

Fuel material shipments are primarily made by truck. The probability of an accident occurring in truck transportation is small, varying from one in a million vehicle miles for minor occurrences to one in 100 million vehicle miles for severe accidents.

Fuel materials are packaged based on the nature of the contents. For example, material, such as yellow cake (U_3O_8) which has low radioactivity per unit weight is designed to retain the contents under normal handling since the potential exposure, even in a serious transportation accident, is relatively small. Packaging for fissile material such as uranium dioxide and enriched uranium hexafluoride

is designed to retain the contents and prevent criticality in both normal transport and in severe transport accidents.

Due to the massive weights of the packaging required, future shipments of solidified high-level wastes are expected to be made by rail. The accident rate for rail [92] shipments is 0.8 per million car-miles. Solidified high-level wastes will be packaged in containers designed to withstand both normal transport and severe transport accidents without loss of contents or significant reduction in shielding.

The public will be exposed to a small amount of direct radiation exposure during the normal shipment of solid wastes. These dosages are estimated to be less than one ten-thousandth of one percent of the natural background radiation.

The report also contains an overview.

As has been discussed, the "Environmental Survey of the Nuclear Fuel Cycle" relates the environmental aspects of the nuclear fuel cycle to an individual model light water reactor. To provide additional perspective, an overview of the aggregate environmental effects from the total nuclear fuel cycle industry is presented for the years 1972 and 1980. For each of these years, industry demands, numbers of plants required for each step of the fuel cycle, and estimated individual plant capacities are given. The aggregate environmental impact of each step of the fuel cycle is then presented in a series of tables and accompanying text.

Our evaluation indicates that the environmental effects of the nuclear fuel cycle that are attributable to the model reactor are small. As stated in the Federal Register [93] Notice of Proposed Rulemaking (37 Fed Reg 24191), the

Commission is considering possible amendments to Appendix D to 10 CFR Part 50 of its regulations. These amendments would deal with the question of the account to be taken of the environmental effects associated with the uranium fuel cycle in individual cost-benefit analyses for light water-cooled nuclear power reactors. Two alternatives are proposed. The first is as follows:

In the case of light water-cooled nuclear power reactors, the applicant's environmental report and the Commission's detailed statement shall contain a full discussion of, inter alia, the environmental effects of the transportation of cold fuel to the reactor and irradiated fuel from the reactor to a fuel reprocessing plant and the transportation of low-level waste and high-level solid wastes (other than irradiated fuel) from the reactor to depositories.

Those documents need not cover the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, disposal of low-level and high-level solid wastes or transportation related to such activities (other than transportation of cold fuel to, and irradiated fuel from, the reactor), since the environmental effects of those activities as related to a particular **[94]** light water-cooled nuclear power reactor have been analyzed in the Commission's "Environmental Survey of the Nuclear Fuel Cycle" and, if factored into the cost-benefit analysis, would be sufficiently small as not to affect significantly the resultant conclusion. The environmental effects of the latter activities will generally be considered in detail in proceedings in which approval for such activities, or closely related activities, is sought.

The second alternative proposed for consideration is the following:

In the case of light water-cooled nuclear power reactors, the applicant's environmental report and the Commission's detailed statement shall contain a full discussion of, inter alia, the environmental effects of the transportation of cold fuel to the reactor and irradiated fuel from the reactor to a fuel reprocessing plant and the transportation of low-level wastes and high-level solid wastes (other than irradiated fuel) from the reactor to depositories. In such documents, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation and disposal of wastes resulting from such reprocessing, disposal of low-level and high-level solid wastes and transportation related to such activities (other than transportation of cold **[95]** fuel to, and irradiated fuel from, the reactor), to the environmental costs of licensing the nuclear power reactor, shall be as set forth in the following Table S-3 of the Commission's "Environmental Survey of the Nuclear Fuel Cycle."

Mr. Chairman, this summarizes our evaluation of the environmental impact of the fuel cycle as it relates to individual light water reactors. We are motivated by the desire to present a full and frank discussion of the environmental costs attributable to the nuclear fuel cycle for light water-cooled nuclear power reactors.

We appreciate the opportunity to appear and to make this statement. We are prepared to answer any questions the Board may have.

[96]

CHAIRMAN PAGLIN: Thank you, Mr. Smiley. It is the Board's plan at present to have Dr. Pittman make his statement first before the Board addresses questions ' the Staff.

Also again, I feel quite apologetic about the lack of sufficient seating arrangements. I am told again they should be here any minute. There are three chairs up front which have not been used.

Secondly, we are contemplating a break about 10:30 or at the time we finish with Dr. Pittman. At that time I would hope that the seating arrangements will be taken care of.

Mr. Murray, may we have Dr. Pittman's testimony now.

MR. MURRAY: Yes, Mr. Chairman.

STATEMENT OF DR. FRANK K. PITTMAN, DIRECTOR, DIVISION OF WASTE MANAGEMENT AND TRANSPORTATION, U. S. ATOMIC ENERGY COMMISSION.

DR. PITTMAN: Mr. Chairman, I am Frank K. Pittman, director of the Division of Waste Management and Transportation of the Atomic Energy Commission.

I appreciate this opportunity to testify on the high-level waste management phase of the important subject of the environmental effects of the uranium fuel cycle. The Division of Waste Management and Transportation (WMT) is broadly involved with this subject, since it has the responsibility for the development, construction and operation [97] of facilities for ultimate management of commercial high-level waste.

The disposal of high-level radioactive waste resulting from the chemical reprocessing of spent fuel from light water reactors is a much discussed problem faced by the nuclear power industry and the AEC. Some people feel that this is the most difficult problem associated with the effective use of nuclear energy to generate electrical energy

and have even suggested that, until there is a demonstrated proven solution, a moratorium should be placed on further issuance of reactor operating licenses.

I would like here to state that there are available today proven methods for managing the high-level waste from the nuclear industry in a way which will assure first that man will not be adversely affected by the radioactivity either by external or internal contact with the waste itself, or by exposure to the penetrating radiation which it generates, and second, that the environment effects will be very small.

In addition to the methods based on proven technology, there are now in various stages of development — but not yet proven — several alternate management methods, any one of which appear to be capable of affording at least equal protection to man and the environment and at the same time to place less of an economic and manpower burden on future generations than do the methods proposed for near term use.
[98]

I will present some details of the current state of the AEC's preliminary engineering of a reference design for a facility to accomplish the safe management of the high-level radioactive waste from the commercial nuclear power industry. In addition, I will summarize the results of the preliminary analyses which we have made of the safety of this reference design, and I will discuss the scope of the effects which this management method may have on the environment.

I will also briefly touch on the status of our program for evaluation and development of as yet unproven alternates which offer promise of resulting in more efficient, and equally safe, management methods for use in the not too distant future.

In this way, I hope I will be able to allay what I feel are unwarranted fears in this area and show that the bugaboo of waste management cannot logically be used as a rationale for delays in the progress of an essential technology for meeting our growing power demands.

Before discussing the details of the management approach to be used by the AEC and to put into perspective the magnitude and timing of the problem, let me point out that under the Commission's regulations, as stated in 10 CFR 50 Appendix F, the first canisters of solidified high-level waste will probably not be shipped to the federal repository until 1983, and under the optimistic assumption on the rate of **[99]** growth of the nuclear industry used for current planning purposes, it will be well into the '90s before significant numbers of canisters of waste will be sent to the Commission for management of the repository.

To further bring perspective to the magnitude of the problem, the total number of reference sized waste canisters to be managed by the year 2010 is of the order of 80,000. The reference canister is one foot in diameter and 10 feet long and will hold approximately seven cubic feet of waste. Thus, the total volume of the high-level waste to be generated through the remainder of the century is of the order of 20,000 cubic yards which is equal to the volume of a one-story, 200 foot square building.

The Commission program for the Federal Repository. In recognition of the need to take timely technical and budgetary steps to assure that facilities are available to accept the commercial high-level waste to be initially delivered in the early '80s, the Commission, in the early spring of 1972, announced that it was proceeding on a program to design, construct and operate a surface (or near-surface) facility

in which the solidified commercial high-level waste in sealed canisters will be stored. The facility and the canisters will be continuously monitored and maintained, and the canisters may be easily retrieved at any time if future technological development offers equally safe alternate **[100]** acceptable options having clear advantage over monitored maintained surface storage.

Since that time in 1972, engineering work on: (1) selection of the specific engineering procedures for receiving and handling sealed waste canisters; (2) heat removal, shielding, monitoring and maintenance of canisters and facilities; (3) conceptual design of facilities; (4) selection of site(s) for the facilities; (5) preliminary cost estimates; (6) preliminary analysis of safety under normal and abnormal conditions; and (7) operating and maintenance procedures, has proceeded with the objective that, while actual construction need not be initiated until 1979, all information needed to request Congressional authorization and initial funding for the first module of the repository will be available in time to allow the Commission, should it so desire, to include at least the initial phases of the project in its FY 1975 budget submission.

Now I would like to give some general considerations about the facility. Any facility used to manage safely the high-level radioactive waste generated by the nuclear power industry must provide that the waste be contained in a way to assure that the radioactive material will not migrate to the environment and that penetrating radiation generated by the waste will not impact on man.

Provision for containment and radiation shielding **[101]** for the relatively small volumes mentioned earlier would be easily achievable by simple containment were it not for the fact that radioactive decay releases significant quantities of

heat for significant time periods, for example, each one foot in diameter by 10 feet long canister may generate as much as 5 KW of heat at the time it is received at the repository. Five kilowatts of heat is 50 100-watt light bulbs, to give you a feel of the comparison. I would like to state this amount of heat generated is only at the initial receipt, after 10 years of cooling in the reprocessing basins, and that that amount of heat decreases with time. We have taken five as the maximum.

Should adequate provisions not be made to remove this heat and transfer it to the natural heat sink of the atmosphere, the waste and the canister would melt. Thus, the major factor in the design of the repository for high-level waste is the technique used to remove the heat from the waste.

The Commission has carried out extensive evaluations of safety, reliability, operability, maintainability and economics of various methods for removing heat, and has essentially narrowed the area for further study to techniques using either water or air as the heat transfer medium. Water has been selected as the medium to be used in the reference design, but continuing study and evaluation is being made for the use of air as the coolant.

[102]

Reference Design. In the reference design concept, the incoming shipping casks, each containing a number of sealed canisters — that number is considered generally to be about 12 for the 100 ton casks — and are removed from the rail car or truck — if it is the 100 ton cask, it will undoubtedly be shipped by rail and not by truck — the cask is removed from the transportation vehicle and transferred into a shielded receiving area.

In this area, the shipping cask is opened and the waste canisters are removed for inspection and any necessary decontamination, repair, recanning or precooling.

Following any necessary pretreatment, the individual sealed waste canister is placed in a water-filled transfer cask and transported through a transfer corridor to a water-cooled storage basin.

Figure 1, which is available in the text that is in the record, shows the plan layout of the receiving cell and its relationship to the cask receiving area and transfer corridor. Figure 2 shows the elevation layout of the receiving cell.

When the transfer cask arrives at the storage cell, it is removed from its rail transporter and lowered with its contained canister into the water basin. The canister is removed, under water, from the cask and moved into its position in the water-cooled storage cell. See Figures 3 and 4.

[103]

The storage portion of the facility consists of a series of basin modules, each designed to hold 500 one foot in diameter by 10 feet long waste canisters. Each basin has its own cooling system where water is circulated by a pump through a heat exchanger immediate adjacent to the basin. External cooling water is circulated through this heat exchanger where it picks up the heat and is then sent to a cooling tower where the heat is transferred to the outside air. Figure 5 shows a schematic layout of the cell cooling system.

The total facility will be constructed in segments on a time schedule to meet deliveries from the reprocessors. Figure 6 shows the reference layout of the first segment which will contain eight 500-canister cells. Figure 7 shows how additional segments will be added in the future, and

Figure 8 shows the presently expected schedules for future deliveries.

Preliminary safety analysis. Detailed safety analyses must be based on the specifics of design and of actual site location which are not now available and will not be until a site is selected and Title I design has been completed. This latter cannot be accomplished until Congressional authorization and funding have been obtained.

Preliminary safety analyses have been made based on conceptual design and on the assumption that standards for protection against the forces of man and nature used for other **[104]** nuclear facilities such as reactors, reprocessing plants, et cetera, will apply.

A situation of considerable concern would be loss of ability to remove heat from the stored cans. This would result in melting of the canisters and waste and loss of some fraction of the isolation of the radioactive material from the environment.

The probability of this situation occurring is prevented by a combination of engineer features including, (a) redundancy of power supply and other essential cooling systems; (b) structural strength to withstand credible forces of nature — earthquake, tornado, et cetera; (c) combination of structural strength, plant security, et cetera, to withstand credible overt forces of man; (d) modular basin cell construction which limits the number of canisters subject to a single catastrophic event.

Thus, before a meltdown could occur, it would be necessary to have a series of failures of systems which will be engineered, constructed, and operated for maximum reliability under rigorous quality assurance programs before a situation could occur where sufficient water could not be

added to and maintained in the cell to keep it from leaking or boiling dry. The timing for such a series of failures to result in uncorrectable situations is important. The individual failure of power systems for circulating the coolant would not result **[105]** in pool water boiling for at least 16 hours. Various corrective actions may be taken any time within a week which would prevent cell water from boiling away. After the complete loss of water, namely after this week with nothing being done, an additional day would be required before the waste would begin to melt. The number of sequential failures required of highly reliable systems, combined with the long time periods available for repair and recovery from each, result in the judgment that this is an incredible incident.

Maximum credible accident. The maximum credible accident that can be conservatively postulated is assumed to take place during one of the various transfers of a single waste canister in air in the receiving cell. It is assumed that the canister is inadvertently dropped to the receiving cell floor. While the canisters are designed to be high integrity vessels and would probably not rupture, it is postulated for this analysis that it will rupture, and that its entire contents will be suspended in the air of the receiving cell. The cell air, containing this full load of waste material, then passes through two sets of HEPA filters. The effluent air from the filters is then assumed to contain 0.02 milligrams of waste per cubic meter of air discharged (Ref. ORNL-4451). Page P-852 is the reference page for the figure of the amount of air passing through the HEPA filters.

[106]

It is assumed that the waste is contained in one complete air change or 400 cubic meters of air. This is the volume of the cell area. Using the values of 0.02 mg/m^3 and 400 m^3,

a release to the environs of 0.008 grams of waste is postulated to have taken place. Dispersion calculations were made using a stack height of 28 meters, under stable conditions and a wind speed of 1 m/sec. This is a situation hwere inversions have taken place and where there is not any wide diffusion of the plume as it leaves the stack.

The resultant exposure calculations are summarized below:

	At inner exclusion Area fence, 0.2 mile (operator)	At outer exclusion Fence 0.7 mile (public)
Estimated first year bone dose	3.8 mrem	2.5 mrem

These estimated exposures for operators and the general public are 0.75 percent and 0.5 percent of the ICRP recommended maximum dose.

Radionuclide releases from "normal" operation. Releases to air. Under normal operating conditions, air releases will be minimal and produce air concentrations both on and off the site that are well below the recommended acceptable concentrations. The sources for occasional releases to the cell air would be material from (1) receipt **[107]** of contaminated casks; (2) decontamination of contaminated canisters; (3) repair or overpackaging of failed canisters that had some pinholes; and (4) miscellaneous clean-up operations around the storage basins.

Since all exhaust air will be filtered through two HEPA filters in series, these events are calculated to result in releases of radionuclides to the atmosphere in the range of 0.001 Ci/yr which is near the lower limit of detection. The maximum concentration of transuranics leaving the stack — before any dilution or diffusion has taken place — is calculated to be 1.3×10^{-12} MCi/cc, while that of the fission products is 1.7×10^{-10} MCi/cc. For the public at the outer exclusion fence, dispersion, diffusion and dilution would reduce the estimated exposure to a very small fraction of the ICRP recommended maximum exposure.

We have made this calculation this way because the actual exposure at the fence site depends so much on the location and the kinds of windrose and meteorology that is assumed, so we thought it would be better to give the figures as it comes out of the stack, before any dilution has taken place.

Now there is another possibility of normal operation releases, and this is releases to the water. Since the water in each cell is isolated from that in other cells and from the outside coolant loop, no contaminated water leaves the **[108]**
facility. However, it is assumed that there will be occasional releases of small amounts of radioactive materials from leaking canisters in underwater storage to the cell water. Such an event would be immediately detected by the coninuous monitoring system of the water in the basin. When such canister failure is detected by the basin monitor, procedures are put into effect to isolate the failed canister and remove it for repair or recanning.

In the meantime, the basin water is circulated through an ion exchange decontamination system. The contaminated resin is then managed in accordance with its level of radioactivity. If it is a very small amount of contamination, it can be handled as a low-level solid waste and buried in approved burial grounds, or if it is a fairly large amount of contamination that gets into the decontamination system, that would be canned and put back into the cell itself as a high-level waste.

The depth of cooling water above the canisters assures adequate shielding of operating personnel. Preliminary

safety analyses, on the basis of the design we are now using, indicate that the radiation level at the water surface would be less than 1 mr/hr.

General safety considerations. As I mentioned earlier, this facility, as well as all other facilities, must undergo a complete reivew. And full consideration will be [109] given in the facility design to such factors as protection against abnormal operating conditions or natural phenomena. The facility will be subjected to the similar standards and criteria and will be reviewed by similar procedures applied to the licensing of commercial facilities handling similar materials.

Environmental effects. To assess the environmental impact from a single 1000 MWE light water UO_2 fueled reactor, it is necessary to assess the total impact of the storage facility to handle the waste from the overall nuclear economy and then assign the unit reactor impact on the basis of the fraction of the total capacity which will be used by the waste from that unit.

Since essentially the main operational activity that will take place at the storage facility is the pumping of cooling water, the major commitment of resources is electricity and water during operation. The other impact is land area and construction materials used for construction of the facility.

For the purposes of estimating environmental effects, it is assumed that the facility will be built to receive and manage all waste generated through the year 2000 with the last deliveries to be made in 2010. A standard sized waste canister of one foot diameter by 10 foot long has been used in all calculations. Based on present predictions of the [110]

growth of nuclear capacity for the remainder of the century, it has been calculated that a maximum of 80,000 canisters of waste, each generating a maximum of 3.25 KW of heat at the time of delivery will be in storage by the year 2010.

Earlier I said we were calculating on a maximum of five kilowatts, and I am using three and a quarter in this calculation. The reason I used three and a quarter here and five for the other statement, is the other statement was based on a mix before reactors, water reactors, gas-cooled, and toward the end of the period, fast breeder reactors, and the amount of heat per container for some of these others is what has accounted for the differences in my earlier statement. We are designing the facility to take up to five. In calculating the impact, though, I assumed that all of the canisters in the facility for this full period of time were water reactor fuel reprocessing canisters, so I could make this fractional statement that I have made here. The fraction of how much of the 80,000 is for the 1000 reactor one year cycle.

Using a waste volume of 2 cubic feet of solidified waste for each metric ton of fuel processed, the reference canister will hold the waste from approximately three metric tons of fuel reprocessed.

A 1000 MWE light water reactor operating at 30,000 MWD t/MT for 300 days a year will discharge approximately [111] 30 metric tons of fuel per year.

Therefore, the reference light water reactor fuel, when processed, will generate 10 canisters of waste per year. This gives a factor of 10/80,000 or 1.25×10^{-4} for the fraction of the total facility effect to be allocated to the single model reactor. Table 1 summarizes the estimates of the effects.

I think I will read these into the record, even though they are listed in the table.

(The document follows.)

Table I

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR HIGH-LEVEL WASTE MANAGEMENT

	Full Facility	Per 1 yr. output of 1,000 MWE reactor
Land Use (acres)		
Temporarily Committee	~1000	~0.1
Permanently Committee	~100	~0.01
Water Use (millions of gallons) (1)		
Evaporated	~1000	~0.13
Cooling Tower Blowdown	~1000	~0.13
Electrical Energy (MWH/yr) (2)	~61 x 10^3	~7.7
Concrete (Cu. yds.)	~120,000	~15
Structural Steel (tons)	~8700	~1
Operating Effort (Manyears)	~200	<1
Thermal Effluent (BTU x 10^9/yr)	~7000	~1
Solid Waste (Cu. Ft.)		
Nonradioactive	~200/day	~9
Radioactive	Max. 50/day	Max. 2

NOTES:

(1) Based on evaporation to remove heat plus an equal amount for blowdown.

(2) For pumping water.

[112]

I think these figures indicate that the effect on the environment of this facility itself is quite minimal. In the documents that is available, which I think has been passed out, there are some figures that show the layout, the present layout.

CHAIRMAN PAGLIN: Excuse me, Dr. Pittman.

Mr. Murray, would you want to have these figures reproduced in the record at this point?

MR. MURRAY: Yes, Mr. Chairman, we would like to have these figures in the record. I might note in this regard that apparently 100 copies of Dr. Pittman's testimony, which contains these figures, sort of got mislaid. We understand it is over in the public documents room, at 1717 H Street, on the first floor, for anyone who is interested.

CHAIRMAN PAGLIN: Could you arrange to have them brought to this room?

MR. MURRAY: We will do our best to get them over here sometime today, yes, sir.

CHAIRMAN PAGLIN: Would you continue, please, Dr. Pittman.

DR. PITTMAN: Going on to the development of other concepts, at the time the Commission made its decision to use the concept of continuously monitored and maintained surface storage for management of the commercial high-level waste, a careful evaluation was made of the extent to which **[113]** research, development and testing work on other potential concepts for high-level waste management should be pursued.

The major current effort is to bring the bedded salt concept, about which so much is known, to the point of proven acceptability by the construction and operation of a pilot facility in a salt bed either in Canada or New Mexico at this time.

Work on this program is expected to reach a point where the Commission would be in a position, if it so desired, to request authorization and initial funding for the pilot facility in the FY 1977 budget submission.

In the pilot plant program about 500 to 1000 full-size sealed canisters of commercial high-level waste would be placed in the pilot facility under completely retrievable conditions. During the pilot plant operation, the canisters would be continuously monitored and any failed or failing canisters would be immediately removed. The facility would be highly instrumented so that the effects of heat and radiation on various parts of the salt bed and its surroundings could be determined and compared with the effects predicted from laboratory and field experimental work.

At the end of the pilot plant operation, and based on analysis and evaluation of data obtained therefrom a decision could be made as to whether disposal in bedded salt had, in fact, been proven safe, economic and acceptable. If **[114]** at the end of the pilot plant operation, or at any time during the course of such operation, use of bedded salt is contra-indicated, the emplaced canisters would be removed from the facility and transferred to the surface storage facility. If evaluation of the pilot plant operation indicated that the bedded salt disposal option is acceptable, the pilot plant could be converted to a full-scale operating facility, ready to accept future new commercial deliveries as well as the material already in surface storage. The possibility that the pilot plant could become an operating full-scale repository would be a factor in selection of the pilot plant site.

We are not selecting a site just for the pilot plant, but one that could be converted later on if information indicated it should.

In addition to the rather extensive program of research, development, testing, design, construction and pilot plant operation underway on the bedded salt concept, the Commission is currently making a thorough evaluation of all other potentially attractive near- and long-term disposal concepts in order to: (1) assure that no feasible concept has been overlooked; and (2) lay the groundwork for future program, should the work on bedded salt not result in acceptability of that concept for very long-term disposal. A final report of this evaluation will be issued in the summer of 1973.

[115]

Conclusion. In conclusion: (1) the program being followed by the industry under AEC regulation and by the AEC offers assurance that the commercial high-level waste will be managed safely from its initial production; (2) the surface storage method, to be used by the AEC, is good for as long as adequate human surveillance and maintenance effort is continued; (3) the probability that work currently underway will demonstrate the use of bedded salt as a safe, acceptable, ultimate disposal method within the next 10 to 15 years is very high; (4) should bedded salt not prove to be acceptable, other acceptable geologic disposal concepts offer reasonable probability of reaching a point of acceptability within two or three decades; and (5) the waste in initial storage will be easily retrievable for either near- or far-term disposal methods when they are developed.

In a word, we have a program which gives us maximum flexibility to meet our early commitments by the completely proven technology now available and at the same time, allows us to take full advantage of techniques which can relieve future generations of the surveillance and maintenance burden, should such techniques become acceptable as safe, permanent disposal methods.

(The documents follow.)

ENGINEERED STORAGE FACILITY
CONTAINER RECEIVING AREA

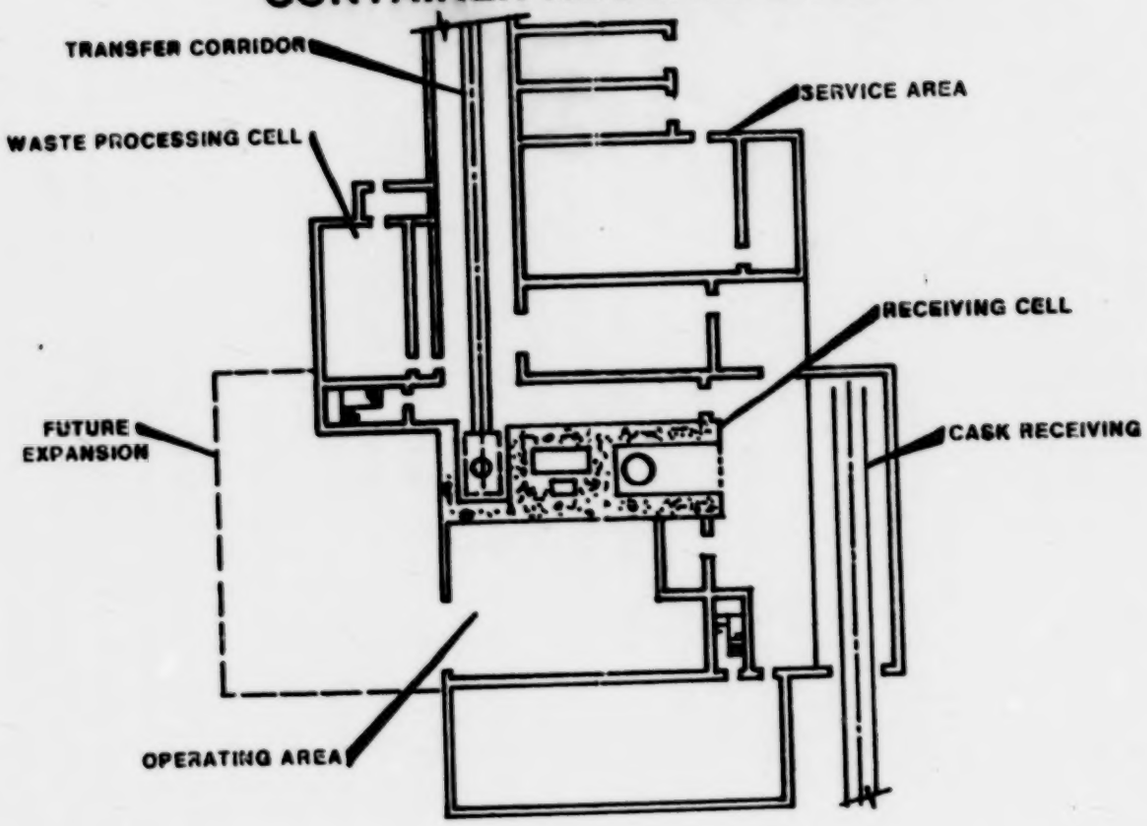

Figure 1

ENGINEERED STORAGE FACILITY
CONTAINER RECEIVING CELL

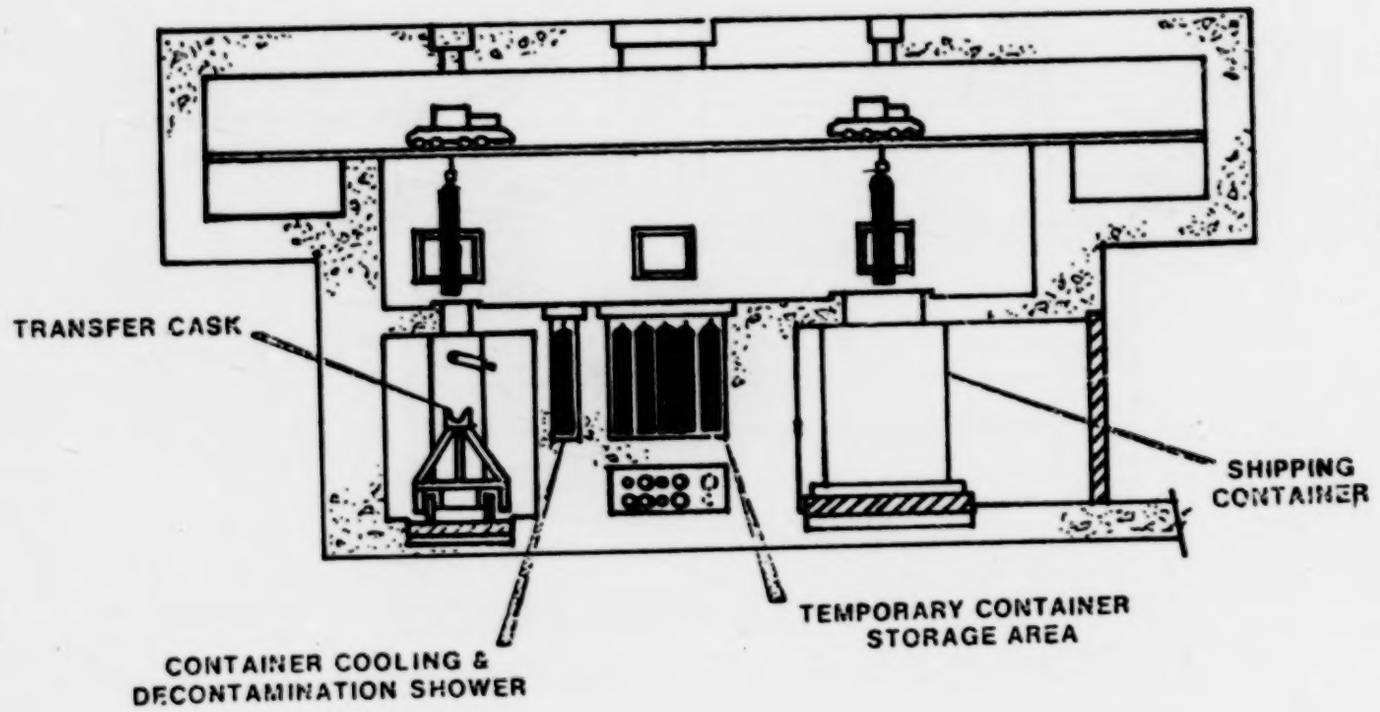

Figure 2

ENGINEERED STORAGE FACILITY
CONTAINER STORAGE BASIN

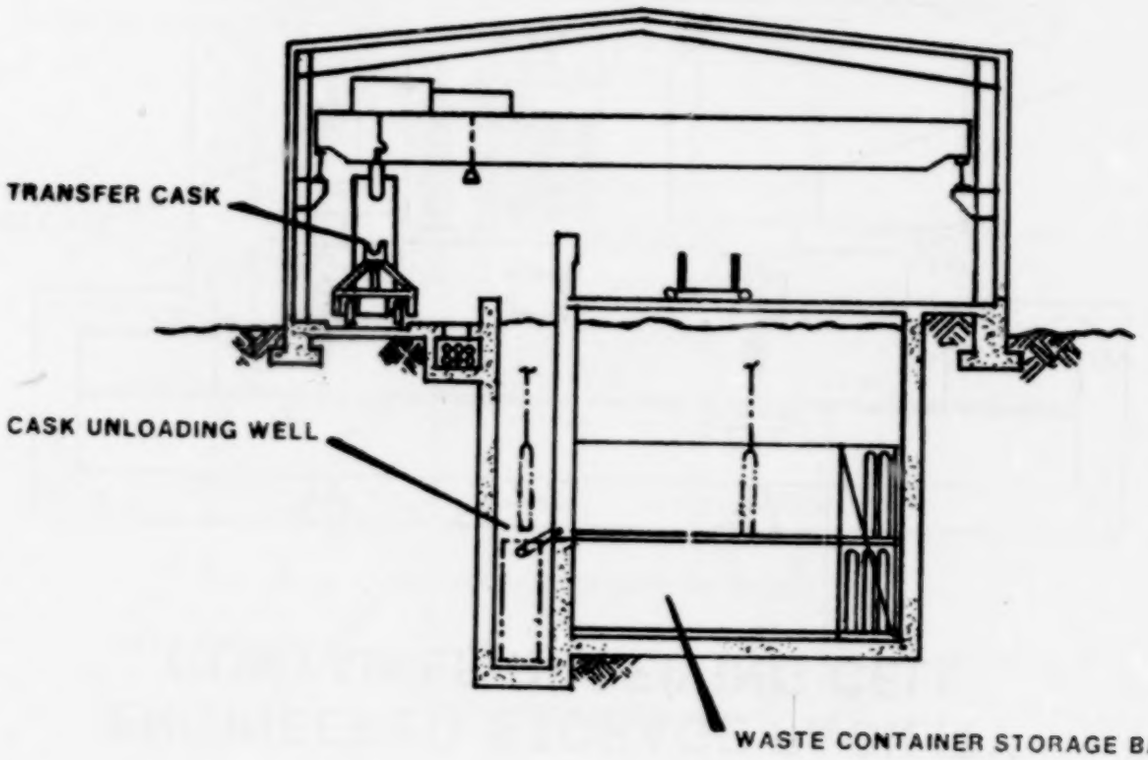

Figure 3

ENGINEERED STORAGE FACILITY
STORAGE BASIN PLAN

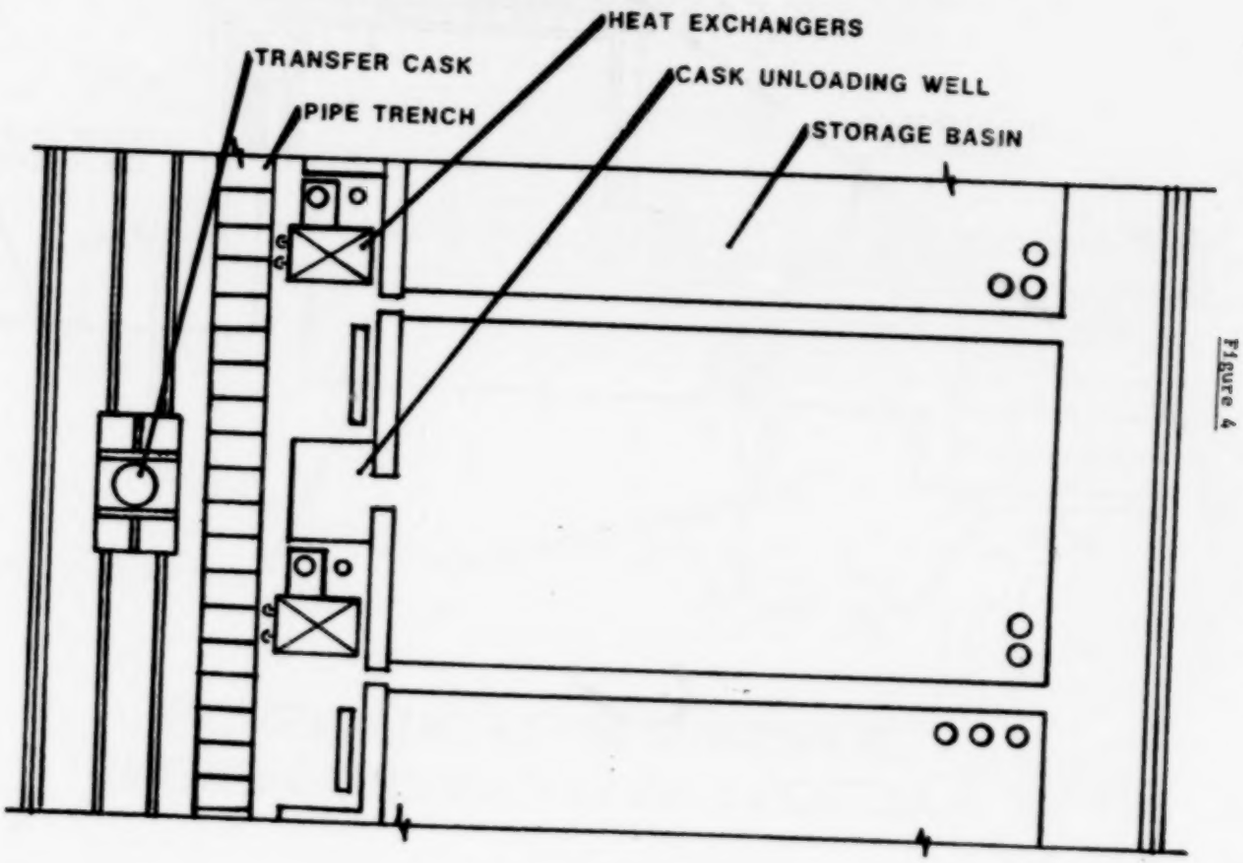

Figure 4

ENGINEERED STORAGE FACILITY
SCHEMATIC FLOW DIAGRAM

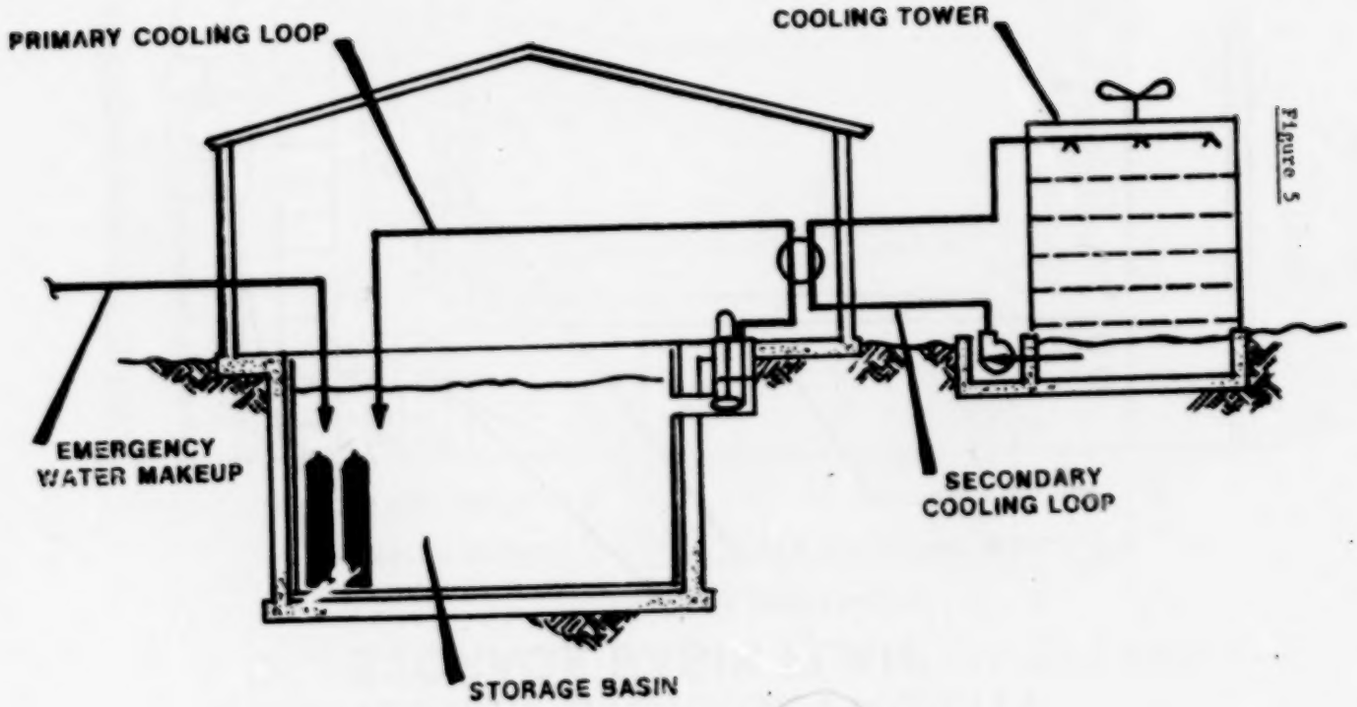

Figure 5

ENGINEERED STORAGE FACILITY
TYPICAL LAYOUT

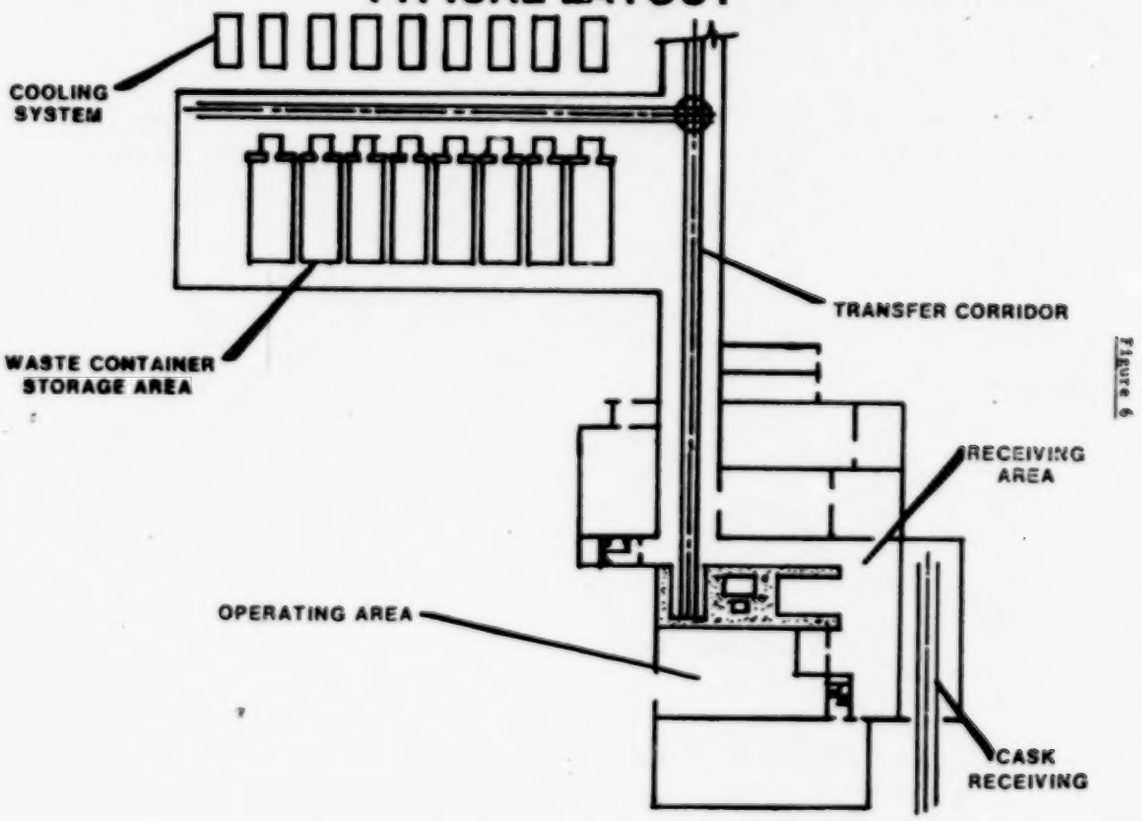

Figure 6

ENGINEERED STORAGE FACILITY
SYSTEM EXPANSION

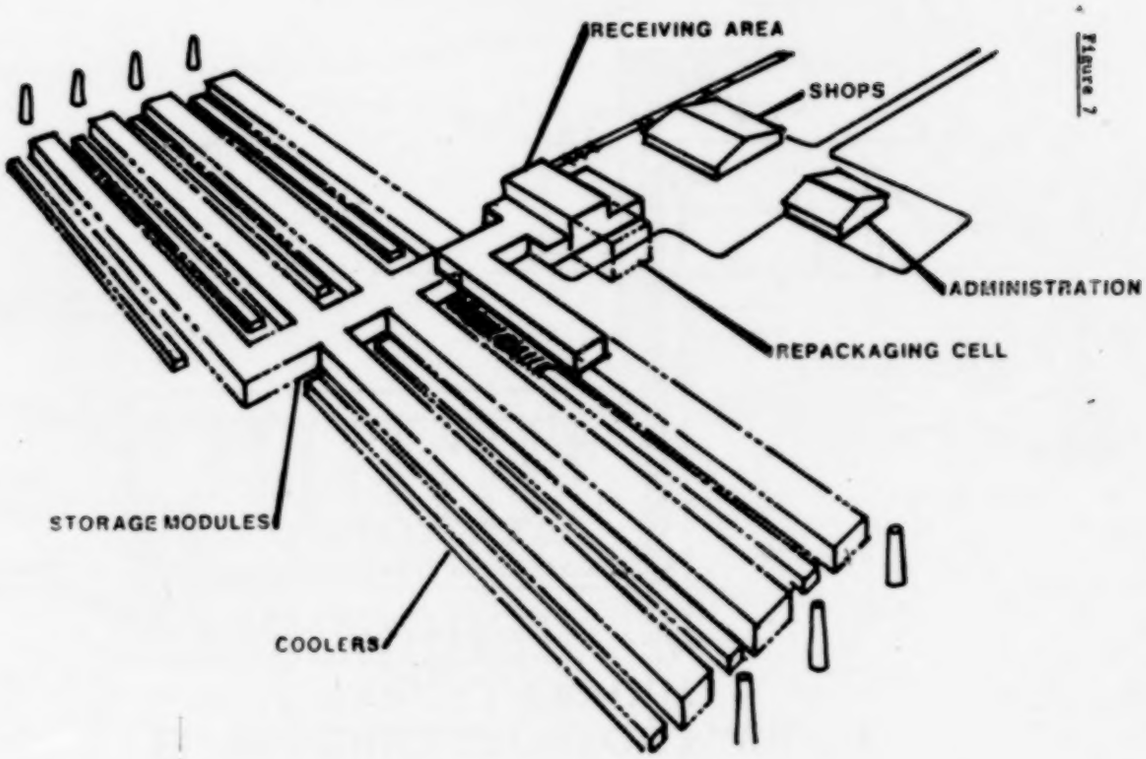

Figure 7

ENGINEERED STORAGE FACILITY
PLANT ADDITION PROGRAM

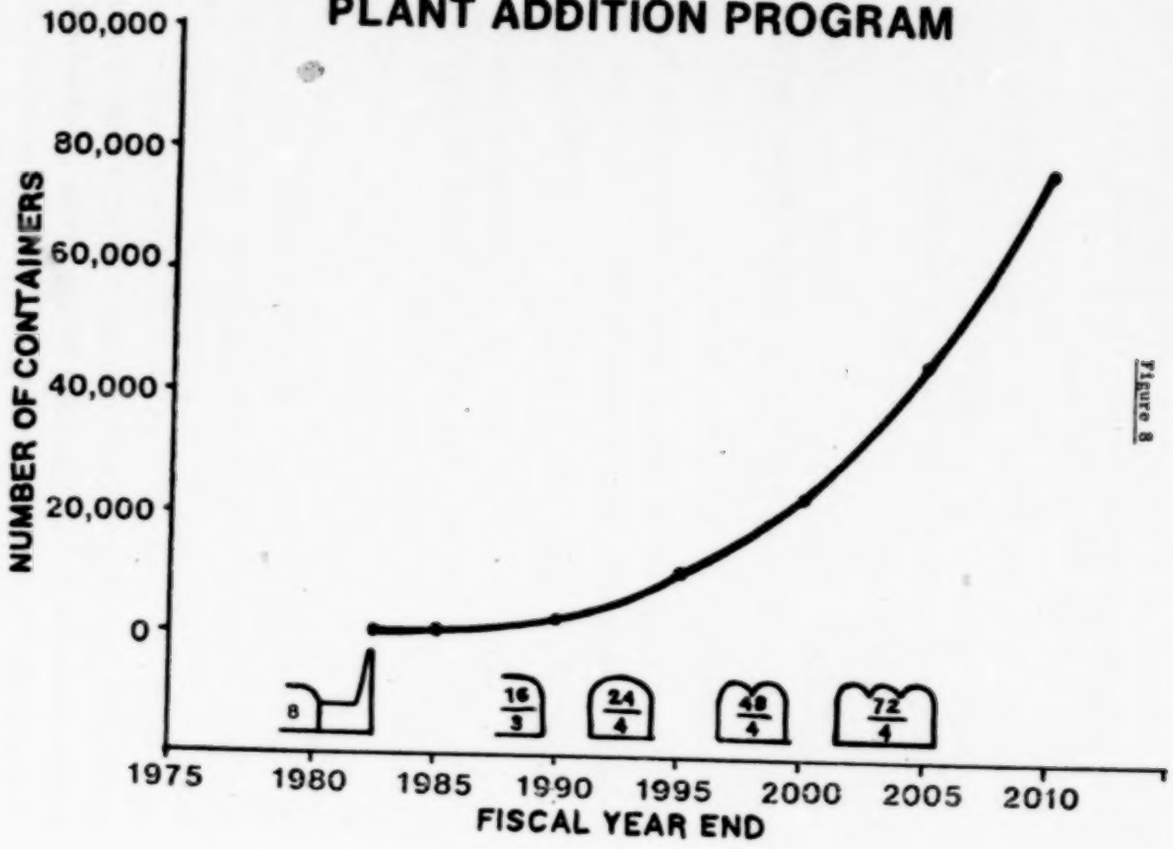

Figure 8

[116]

MR. MURRAY: Mr. Chairman, I believe there was a figure misread as a trillion, it should have been a billion. It makes some difference there. Dr. Pittman can clear that up. He is looking for it right now.

While he is doing that, I might add, so that the record is perfectly clear on this subject, that we gave copies of Dr. Pittman's testimony 48 hours in advance to the Board and every participant.

CHAIRMAN PAGLIN: Yes. Thank you. The 100 copies you referred to are for the people in the room.

MR. MURRAY: That is correct.

DR. PITTMAN: Where I said trillion in the thermal effluents, it should be billion in the table.

CHAIRMAN PAGLIN: Thank you, Dr. Pittman.

At this point it appears to be an appropriate time to take a 10-minute break and then we will return to questioning by the Board of the Regulatory Staff.

(Recess.)

CHAIRMAN PAGLIN: May we resume?

MR. MURRAY: Mr. Chairman?

CHAIRMAN PAGLIN: Mr. Murray.

MR. MURRAY: We are undertaking to send a messenger over to the public documents room to obtain extra copies of Dr. Pittman's testimony. I just got a bad rumor that we may not be able to find them over there, someone just came up [117] and whispered in my ear. We are not trying to hide Dr. Pittman's testimony, and we will do our best to get copies to everyone who wants a copy, even if it

requires writing to me, James P. Murray, U.S. Atomic Energy Commission, Washington, D.C. 20545, I will guarantee a copy of that testimony.

CHAIRMAN PAGLIN: Thank you, Mr. Murray. I am sure that no one is trying to hide anything. This is a public hearing. All right.

DR. PITTMAN: I would like to say I hope not, because I made an awful lot of copies and I have an extra hundred at the AEC, plus a hundred that have been sent down here.

CHAIRMAN PAGLIN: We will see that they get here before the day is closed.

We would like now to proceed to questioning by the Board members of the Regulatory Staff. Thereafter we will then proceed with the presentation by the Environmental Protection Agency.

Again I would contemplate adjourning for lunch around 1:00 o'clock. That looks like the schedule right now.

Dr. Geyer.

DR. GEYER: In conducting the questioning, Dr. Steindler and I will switch back and forth. My questions in some cases have several parts. I think it will be the best [118] scheme to read through all of the parts, so you can see what the questions are being addressed to the problem involved. And then if you want to go back and repeat the parts of the question, I will be glad to do that. We have decided that about 45 minutes is the time available to us in view of the other people that wish to make statements this morning. The fact that we will not use more time than this will not necessarily mean that this is all of the questions we have. So we will be coming back from time to

time. And even then it may be that we are not covering in great detail all of the things that we might possibly ask questions about, but we will be dealing with things that seem important to us.

My first question has —

CHAIRMAN PAGLIN: Excuse me, Dr. Geyer. Mr. Murray has signaled he wants to make a statement.

MR. MURRAY: In that regard, Dr. Geyer, we would be pleased to try to respond to any additional questions that you feel you don't have time to ask at the conclusion of the prepared presentations, or in writing, or however the Board wishes.

DR. GEYER: Yes. We would anticipate this would be the case. Of course, the other statements may raise a good many of the problems that we might question on.

MR. MURRAY: Yes, sir.

DR. GEYER: The first question I have is one **[119]** just primarily for clarification. I think many people here know the situation, there may be some that don't, so I would like to ask what parts of the fuel cycle are under the recognizance of the Regulatory Staff of AEC.

MR. SMILEY: We start with uranium milling. Now in the environmental statement, because of the fact that now most of the plants that are being built are mine-mouth combinations, in other words, the mill and mine are associated, and this largely comes about because of the economics — I think it costs about five cents a ton mile to transport the ore. The mine is considered in the environmental statement in terms of the offsite effects. As you noticed, I covered in my testimony the overburden, we treated the overburden and any radon at the site perimeter.

So the milling, in terms of the application itself, the safety analysis, the environmental report, and the mining as it relates to the milling, because the mine-mouth combination. Now we also cover the UF-6 manufacture.

There are commercial plants that manufacture uranium hexafluoride, so that is covered. The isotope enrichment is done by the Commission, and we do not cover that in our Regulatory licensing decisions. We cover the fuel fabrication and that would include the conversion of uranium hexafluoride to the uranium oxide, all of the steps involved therein. Some fabricators, for example, end up with **[120]** a uranium dioxide power, three particular fabricators, I think, go all of the way to the UO-2 pellets, and the final subassemblies. So we cover that.

We then cover fuel reprocessing, spent fuel reprocessing.

The other steps covered are waste management, because we have licensing responsibility for waste burial grounds, commercial waste burial grounds. Those that are not under agreement states, I might add. There are some commercial waste burial grounds under agreement states. There are also some uranium mills that are under agreement states.

We cover transportation of material between licensees. And in this regard, of course, we have very much in-depth reviews of containers, we have regulations spelling out our requirements. For example, in terms of a fuel reprocessing cask, we look to shielding, criticality, structural analysis, heat transfer, quality assurance.

I think that covers it.

DR. GEYER: Do you have sole responsibility for transportation?

MR. SMILEY: Transportation in the commercial sector, yes, sir. As far as the other transportation activities are concerned, under the Commission, this falls in Dr. Pittman's area. I guess we ought to mention that we have an interagency relationship with the Department of
[121]
Transportation, and we have a memorandum of understanding with them. For all practical purposes, we in the AEC do the reviews of the casks and the containers.

DR. GEYER: You do the regulatory work and the monitoring?

MR. SMILEY: Right. They are responsible once the carrier picks it up, right.

DR. GEYER: My next few questions will be related to matters discussed in the yellow book, the Environmental Survey, and I think it would be easier to give the page numbers and then ask the questions.

The first is on page S-13. This question has three parts and deals with the sentence under item 5 there at the bottom of the page. The first part of this question is how are environmental considerations "normalized"? The second part is, is it assumed that the environmental effect of multiple activities of a single kind is a simple multiple of the effect of a single activity of that kind? And under what conditions, if you make this assumption, would this prevail?

So the first is, how are the environmental considerations normalized, the term used here?

MR. SMILEY: I guess I would start by saying it is not easy to take an industry where for each step of the fuel cycle you have different flow sheets, and you also have
[122]
different size reactors. What we did was we recognized

that reactors are built to various sizes, some reactors are smaller than a thousand megawatts mentioned, and others are larger. A thousand megawatts looked like a good number to use, because certainly if we take the environmental effects and we consider the total effects, and then assume that each reactor is a thousand megawatts in size, we will come very close to what will be the environmental effects associated with any one reactor that is up for licensing.

DR. GEYER: So the total effects of all reactors?

MR. SMILEY: Essentially what we said was this — yes — actually we were conservative. We essentially set the amount of fuel that would be required for an annual reload. I think the number came out to be 33 tons. And we said to produce that 33 tons of fuel, which actually is a little more than you would get for a 1,000-megawatt reactor, if you really do closely the balance between PWRs and BWRs, we took that 33 tons and said these are the effects from these 33 tons. You need to produce so much uranium at the mill, you have to make so much uranium hexafluoride, you have so much work at the diffusion plants, fabricate so much fuel, reprocess so much fuel. So all of the effects related to that, when we talk about land use, other natural resources, effluents, it was on the basis of that 33 tons.

Perhaps a better statement might have been we [123]
normalized it to the 33 ton annual reload. But that is close to the requirements for the 33 thousand ton megawatt reactors.

Is that responsive to the question?

DR. GEYER: I think it is. There may not necessarily be a linear relationship between the effect of one plant and the effect of 10 plants, you know.

MR. SMILEY: That is correct. I think it is conservative this way, myself.

DR. GEYER: The way you have done it?

MR. SMILEY: The way we have done it, yes, sir. I might mention, Dr. Geyer, that each facility that we look at is licensed and evaluated on its own throughput. So what we have done here is quite apart from that. It is just an attempt to — okay.

DR. GEYER: The next question has to do with the table on page S-14, Table S-3, and as an example of how you arrived at the numbers in this table, what is the basis for the figure of 63 acres?

MR. SMILEY: Most of that comes from the milling. Again what we did is we took a site, I mean the model mill, for example, and we set that site — I think I have — we set that site on the basis of what we considered to be a reasonable model of the total industry.

Now we established a perimeter, we established how much land would be required for the buildings, how [124] much would be exclusion area. Again I think we took a conservative point of view. Then we said if one mill, for example, will turn out, as I recall it, an average size mill will do about five or six reloads, we said if you needed so many acres, let's say 300 or 400 acres for a total mill, a model mill, then an individual annual reload would take one-fifth or one-sixth of that, because of the fact the mill had the capability to turn out more than one annual reload.

DR. GEYER: In real life operations, how much variability would you expect to encounter in these figures?

MR. SMILEY: I think there would be a lot. And I think that we took a conservative point of view. For example, in

the mine we used 3000 acres as the total exclusion area. So I think there are some that are smaller. But always the attempt was, and maybe this is a good time to make this point, the attempt was to try to put the maximum amount of impact, environmental impact, on the annual reload, if we could do it.

DR. GEYER: On that same table, but on the next page, the second line from the bottom, there is a statement that "no significant effluents to the environment" — what is the basis for this?

MR. SMILEY: Where are you, please, sir?

DR. GEYER: The same table, S-3, on page S-15, the second line from the bottom.

[125]

MR. SMILEY: Yes. I think I also stated that in my testimony, and that is the tailings that we referred to here, we are pumping tailings, including some of the liquid, over to these tailings ponds, which are designed to withstand natural forces and also to retain the tailings. Now because they are not completely impermeable, although after some period of operation, the slimes have a tendency to seal the fine pores of the tailings pond, normally it is not an effluent. It is not an effluent because the tailings, including the solution, are retained in the tailings pond and you lose the water, sometimes the water is repumped into the mill for reuse, and the rest of it is lost by evaporation.

Also there are other effects. Because of the fact that the water flows through soil, there are ion exchange effects, the radiation is essentially removed. So, for example, nothing or very little radium enters the flowing streams. There is a network, a radium network, I think they call it, and for the Colorado River basin, and measurements are made of radium in the flowing streams, and the values that

I have seen are very low, most less than one picocurie per liter. And this compares to a value of three for drinking water, and 30 in the AEC standards.

So there is a continuous monitoring network that the states are involved in, and this is where the data comes from. It is for this reason we reached the conclusion we state **[126]** in the report.

Mr. Murray just suggested that I say it is true, the land use for the tailings pond is already excluded in the 63 acres.

DR. GEYER: I presumed this was so. The record in the mining industry generally isn't all it might have been. Has a study been made of the ultimate fate of tailing ponds associated with milling and mining operations after they are abandoned?

MR. SMILEY: After they are abandoned? Let me say this, that this is not an easy question to answer. The AEC has control, as perhaps you know, over all of the operating mills and as a result of the NEPA, we now insist on arrangements for stabilization and long-term care of tailings.

For example, with the mill, the Humble mill that Humble Oil just built, we have a provision that there is a long-term care for 50 years after mill shut-down, and I think the mill will run, say, 15 years, so that is 65 years.

States are working on legislation for land reclamation. In terms of the mills that are shut down, these are the responsibility of the state, and of course the AEC has taken responsibility in this regard with respect to special problems, as I am sure you are aware of, in Grand Junction.

The mills that are shut down are not something AEC is looking at specifically. It is not within our jurisdiction. **[127]**

But I must say we have an agreement state program, and we work very closely with the states, and we are insisting that the states look closely at the problem that you raise. There are three states, for example, I believe Wyoming, New Mexico and Utah, where about 88 percent of all of the uranium reserves are, states that are looking into land reclamation acts. And I suggest through this kind of action and through the radiation control programs of the directors of the various states, and through the obvious publicity of the mill tailings problems, we will see real progress in terms of care for abandoned mills. But they are the responsibility of the states right now.

I was just going to ask Don Nussbaumer if he would like to add anything to that.

MR. NUSSBAUMER: No, not at this time.

DR. GEYER: Thank you.

Now my next two questions are for information which if you don't have it right now, can be supplied later. But they are with respect to page B-13. I don't see where I have it marked on the page.

The question is, what is the quality of the water in these tailings ponds?

MR. SMILEY: It is quite acetic.

DR. GEYER: Do you have analyses you can supply?

MR. SMILEY: Yes, I am sure we do.

[128]

DR. GEYER: The same question might be asked also about what is the quality of the water pumped from the mines?

MR. SMILEY: Well, the mines also put up ponds, and I must say the primary motivation initially is to recover

the slimes, because that is pretty good ore. But the water is also dammed and ponded from the mines. This is the drawdown you are talking about?

DR. GEYER: Yes.

MR. SMILEY: Right. And it is allowed to find its way down washes and draws to various flowing streams. And again the radium quality of the water in the Colorado River basin, which covers a very large area, is a fairly good testimonial to the quality of the water from the mines.

DR. GEYER: If you have data on that, I would like you to supply it.

MR. SMILEY: Yes, sir.

DR. GEYER: The next question has to do with the last sentence on B-20. It would be useful if you could supply additional information on what is meant by the word "excessive" and what you have in mind with regard to the treatment. These are very general terms that don't tell you much. You need not supply this now.

MR. SMILEY: Fine. We would be glad to do that, sir.

DR. GEYER: I think I have been going long enough.

[129]

Dr. Steindler?

MR. SMILEY: Excuse me. I could make one piece of information available now. As far as we know, the one thing we should mention is that this industry, unlike maybe the nuclear power industry, has been going on for some time, because of the military requirements in the '40s, so we have about 30 years of experience. Our information is that the AEC Region Four, I believe the Denver office, it is the compliance office, reports only one case of contamination of surface waters by radionuclides, and this occurred

— I don't think it adds much to say it agreed in an agreement state, where we don't have a responsibility, but that is a fact. However, we work closely with the agreement states on these problems.

[130]

DR. STEINDLER: Let me make a comment, to begin with. I think part of the problem, if there is a problem with the environmental survey as issued, is the title. The survey title is "A Survey of the Nuclear Fuel Cycle," and I think part of the channeling of the contents of the document obviously is going to deal with this unique classification.

But before we get into that, let me make another quick statement, that my questions are likely to be generic. That is I don't think we have time at this point to delve into the problems, the potential problems with the numbers and specifics. Let me bring a couple of things out. First of all, is it correct that this is in effect a draft document to be ultimately perhaps revised in response to questions and comments on the additional testimony which may raise questions or challenge particular aspects?

MR. SMILEY: Well, certainly we sent it out for comment and we were very serious, so we will want to see what comments back in, as you suggest. Also the testimony at this hearing. And then make a judgment as to what we ought to do. We can do anything, I guess, from errata sheets to a rewrite. I don't think we rule out that latter possibility.

DR. STEINDLER: I think it is perhaps pertinent at this point also to have some discussion as to the rationale or the role of the exclusion of plutonium as a **[131]** fuel cycle participant, and then subsequently I think we could get into the question of how come we are fairly silent on

plutonium as a product from a reprocessing plant. Initially perhaps you could give us some rationale for why plutonium was excluded as a participant in the fuel cycle, and where you see it coming into play, either subsequently or what are the plans? If you could address yourself to that question and follow that up, perhaps, with a similar comment on HTGR and the uranium thorium fuel cycle.

MR. SMILEY: First, let's take plutonium. There is no question that we will handle mixed oxide fuels sometime in the future in a similar analysis. Right now reloads are strictly uranium dioxide. And the plants producing plutonium, as a matter of fact, mixed oxide fuel, are rather small. Mainly those people who are involved with plutonium, say 95 or more percent of plutonium being handled today, is handled for the fast breeder reactor program.

We might be talking about 1000 kilograms of plutonium altogether, two contractors handle the major amount of that, practically all of it. So we don't have a viable reload industry today.

Now, secondly we wanted to get this document out and have it truly represent what is going on today. So indeed we addressed it to the UO_2 fuel. I could tell you more about the rationale, but is it sufficient to say that we **[132]** definitely plan to put one out on the mixed oxide fuel and it is not the first one on our list, the first follow on, it would be probably the next.

By this time, I think we will have a lot more information about the whole mixed oxide fuel cycle. As I say, the plants are small today, fabrication plants; even data on reprocessing is such that the existing reprocessing plants can't fit the flow sheets immediately to the plutonium fuel reprocessing. So there are things we still have to learn. This is

not to say, incidentally, that when we license a plant for handling plutonium for mixed oxide fuel, we don't do a thorough study of that plant. In fact, plutonium plants get special loving care because of the fact that it is a hazardous material, and to the extent that we look at natural phenomena, like we do for reprocessing plants and reactors. Now the HTGR, we have started on that, you are absolutely right, this is something we have to do.

I would expect that at some time within the next six to eight months, we will have a similar document on the HTGR. The problems are somewhat different, as I know you know, and we have to deal with uranium-233, parts per million of U-232 in it, which has long lived very hard gammas. That is in fabrication. We have to deal with a thorium flow sheet, with high enriched uranium-235. We **[133]** expect to have something on this which will approximate this document you have seen on the HTGR in about six to eight months. The one part of the flow sheet that we will have t[illegible] go on the basis of research data and development data is, of course, the reprocessing, because there is no reprocessing plants for HTGR now and the fuel, as I understand it, is being stored in Idaho.

Does that answer your question?

DR. STEINDLER: Yes, but let me get back to the question of plutonium and the reprocessing plants as a product. There were a couple of points there. Perhaps this might be a good time to touch on those. I think a careful reading of this document makes it reasonably obvious that the silence, the apparent silence on one of the major products of the reprocessing plants is outstanding, and specifically I am talking about plutonium.

What is the current attitude of the staff in relation to the whole question of plutonium, plutonium load-out, plutonium

storage, particularly since apparently the plutonium that is going to be coming out of reprocessing plants is going to have to be stored, if in fact the industry is not yet ready to go into plutonium loadings? Where and how would you estimate that this kind of thing should be treated, if you worry about the fuel cycle as it currently stands here?
[134]

MR. SMILEY: Well, you are right about the silence on plutonium, except, of course, we did note that storage was the one issue we talked about. The reason is because the light water reactor fuel cycle ends with storage of plutonium and for those who are not aware, I would like to make that clear; I know you are aware of that. The fact of the matter is when you reprocess UO_2 fuel, you end up with plutonium, and until there is a use for it, it will be stored.

Now if you are asking about the technological questions involved, storage of plutonium, certainly we feel is within conventional engineers' wisdom, and storage facilities are available, others can be built. The responsibility will be the industry's to store plutonium until such time as they convert it to other forms for reuse. Storage containers can be designed safely. And certainly can be put into a structure just like a reprocessing plant or other plutonium facilities, where we don't have concern about such things as natural phenomena. That is all one would think he would have to treat, I would suppose, in terms of plutonium, until such time as it is shipped out. In actual fact, I think you are right, and I think the next one we will do after HTGR will be the mixed oxide fuel. So the practical aspect will be that there will be storage for plutonium, maybe more than people are now allowing, but **[135]** eventually the stuff will be shipped out.

DR. STEINDLER: I am trying to draw the distinction between plutonium as it is converted into fuel, used in LWRs, and plutonium as a product of a reprocessing plant today, or whenever the plant cranks up.

MR. SMILEY: You mean for use in the fast breeder or something?

DR. STEINDLER: No, plutonium as it comes out of LWR irradiated fuel. Since it is a product, it has to be handled. So you have a load-out area which produces whatever their rate is.

MR. SMILEY: I see. Well, in a sense we have —

DR. STEINDLER: Let me comment. That is precisely the impact, the impact of that kind of operation, which may seem small in terms of tonnage, but is not necessarily small in terms of risk, that it seems to me might well be part of a revised or addition to this document.

MR. SMILEY: We could look at that. My feeling is we have sort of treated it, and the reason I feel that is the everything in — when that plutonium is handled, until it is loaded out, it is behind five feet of concrete. So we have certainly treated it in effluents. I should make that clear. When we look at the effluents from the reprocessing plant, plutonium is a radionuclide that is considered. So that extent, in terms of gaseous effluents, we have treated it. **[136]** Liquid effluents, we are storing on site. So essentially that is treated, too. I mean it is not a product that goes to the environment. In terms of accidents, we have treated a critical accident in the reprocessing plant as part of the survey, so in a sense we have addressed ourselves to that. And the load-out is included in the reprocessing plant effects. It might have been a little more substantial, and perhaps can be clarified.

DR. STEINDLER: That is in effect what I am suggesting. Let me ask one more question on this. Because the reprocessing plant must handle plutonium, the reprocessing plant would surely generate low beta gamma wastes, which are plutonium contaminated, be it equipment or whatever. The disposal of that material is subject to, it seems to me, some kind of an environmental analysis.

I am wondering whether it wouldn't be worthwhile detailing what the Commission's current approach is to the storage, retrievable or otherwise, of that kind of waste, and I am laboring under the impression that there are some regulations which have been promulgated by the Commission to deal with contractors' approach to that problem, and it might well be of interest to at least comment on that.

MR. SMILEY: You mean the contractors' approach to handling low-level waste?

DR. STEINDLER: Yes, and the segregation question.

[137]

MR. SMILEY: I would be pleased to make a comment on that.

First, it is really fair to say there is very, very little, if any, low-level waste that leaves the plant, transuranic wastes that leaves the reprocessing plant, practically all of the low-level waste, and this is in the thousands and hundreds of thousands and later millions of cubic feet of low-level waste, will come from the fabricators. When we look at the plutonium cycle on reload, that will be an important part of the elevation. So you can look for that in that part of the survey. Now it is true that the Atomic Energy Commission contractors, those who have facilities available, are now being asked, I believe it has been for a couple of years, and Dr. Pittman can add something to this, maybe, they are being asked to store the low-level wastes

on site. It is true also, and I think fair to say some contractors, like Argonne National Laboratory, for example, ship low-level waste to commercial waste burial grounds still, because they don't have available facilities on site. We presently are allowing our people — I am now talking essentially outside of this survey, but I think you have asked a question a lot of people are wondering about — we are now allowing our people to ship low-level alpha waste, transuranic wastes, to commercial waste burial grounds. I think it is also fair to say we are looking at the [138] question very seriously, looking at what the options are, just as the general manager of the Commission has done, such things as retrievability, having alpha wastes stored that is retrievable in storage facilities, defining what a cut-off point might be where one might allow plutonium wastes down in some very, very low-level, to go to commercial waste burial grounds.

So that is a very serious problem for us to look at. And even more so, now, because of the build-up of plutonium. One other thing might be of interest to you. We are encouraging industry to minimize the amount of low-level waste that they generate, right from the design stage, and I commented on this to industry in September at a meeting of the industrial people. Also we are looking at ways of, through Dr. Pittman's organization, of how to handle low-level wastes, incineration of leaching, this kind of thing. The combination of these approaches, plus our very strong desire to minimize the amount of low-level waste that we have to deal with, I think will see new policy decisions in the near future.

DR. STEINDLER: Our time schedule is going to run out, so I was trying to find out how flexible it really is. As a generic comment, one of the, I think, outstanding practices of the Staff has been in the past, at least as far as I can

tell, to meticulously document the assumptions that [139] are made in the discussions. I find that that has not been done here and as a consequence leads to some of the kinds of questions that I think Dr. Geyer was asking and could lead to a rather long engagement between us on how you got this and where you got that. I guess I must assume that one of the reasons that those assumptions have not been documented and clarified or justified in the purest sense of the word, is because of the time schedule required to get this thing on so we could get to hearings. Can it be assumed that if there is going to be a significant revision to this document that in those areas where assumptions are made, particularly where there is a statement to the effect that something is trivial, or insignificant, that somewhere there will appear in that same document some kind of justification based on data or a reference which one can go back to and find the source.

If that is a reasonable assumption, then I can, you know, move on from my present set of questions. If not, then I have to poke around a bit more.

MR. SMILEY: Well, we supplied references, obviously, to put as much as we could into the references so one could go back and see how we did the work. I would say that the goal of the Staff was to take every one of those comments and to say how we got the information. I certainly feel that it is in order to go back and look at it [140] once again, because sometimes what might be obvious to us is not obvious. So we will do the best job we can on that. I appreciate your raising the point.

DR. STEINDLER: I am simply suggesting it is probably worthwhile to be sensitive to what may seem like nit-

picking, but really represents perhaps a serious question as to how you got from A to B.

MR. SMILEY: You don't want the survey to include all of the information? You mean the references themselves?

DR. STEINDLER: I think references are perfectly adequate. I am personally used to reading documents which, if they make a statement that could be subject to some kind of inter-presentation, having some reference attached, so I can go back to see what the basis was.

MR. SMILEY: We will make every effort to go back and see if we can improve that.

DR. STEINDLER: There is another question that arose regarding the magnitude of the liquid effluents. The standards of comparison in this document seem to be in general. Following dilution by whatever appropriate body of water we put our effluents into. And while I am not an expert on current regulations, I got the impression in talking to people, that at the moment concentrations are being thought about in terms of as they are discharged, rather than as diluted.

[141]

MR. SMILEY: Yes.

DR. STEINDLER: If you were to use the as-discharged criteria in all of the whole rather substantial mass of data, do you foresee that the conclusions that you have reached in general would be significantly changed, and if so, where?

MR. SMILEY: Well, you may not be an expert, but I think you are quite right on the fact that new regulations are very close, or in practice, or for effluent discharge, and you are largely talking about nonradiological now.

DR. STEINDLER: Right.

MR. SMILEY: Right. It is true if new regulations, state or federal, indicate that the water quality has to meet certain levels before discharge, then that is what will be done in our industry and we would be a part of that as well as every other industry. There will probably be a time frame associated with it, too, so people can be permitted to do something. It is interesting to note on that that, as I recall it, there are three major nonradiological constituents of interest, just to put it in perspective. One, as I recall, was ammonia, another fluoride, and a third was nitrates. Flowing rivers that we look at for our fuel cycle run average flows of eight to nine hundred cubic feet a second. And the only one that required large dilution was
[142]
ammonia. Fluoride is in the range of, I think we said seven; it might be closer to 70 cubic feet a second, looking at the number again, and that is part of the corrections we will make.

One of the others was a very few cubic feet a second. So it is not a serious problem. But if regulations come about, we will be requiring that those regulations be met within a time frame.
[143]

DR. STEINDLER: You have devised a model plant possibly by taking an average of the industry or possibly by adopting the most recent flow sheet that seemed to make sense and most of these adaptations are obviously necessary, otherwise you would be calculating yourself to death.

On the other hand, I think one of the better ways to estimate how sound that model is in relation to the industry is to provide some kind of spread of information on what are the limits, not from the model plant, of discharge, say,

or impact, not from the model plant but, rather, from the extremes of current technology.

Is it reasonable to put, or would it confuse the issue to put into a document such as this the range of, for example, fluid discharge from all of the plants, from the plants that currently exist that you have records of? The Commission I presume has accurate records on what is being done. And would that serve any particularly useful purpose in identifying where the model stands in relation to the extremes and where the most extreme environmental insult could be expected to fall?

MR. SMILEY: Well, I think we could do that. It would surely lengthen the document considerably, create a lot of work.

DR. STEINDLER: That is not my object.

MR. SMILEY: My own feeling is — Under the present
[144]
circumstances, I'm glad to hear that. Obviously I believe it doesn't change the conclusions. We had prepared information obviously to reflect — for that report, I mean — to reflect a conservative point of view.

For example, in fuel fabrication, the model — At least eight or nine out of ten fabrication plants were well below in effluents what we assumed for the model and accounted for about all of the UO_2 that was made. So to that extent I think you should feel relaxed about what the model does, in that it is conservative.

I think it would take a lot of extra work to put all of that in the report for every part of the fuel cycle.

DR. STEINDLER: Let me give you the thought I was trying to develop.

I would presume, and I haven't been a party to that kind of an investigation, so I'm just presuming, that if someone looks at a reactor, he looks at the reactor in question, and not the average of all of the reactors in the country, but in fact asks what is the impact on the environment of the particular reactor.

MR. SMILEY: Right.

DR. STEINDLER: It is that local impact that I think in a sense is missing here by averaging this thing out.

MR. SMILEY: I think I can handle that question.

We do exactly what you are suggesting in every [145] licensing action we take on a fuel cycle facility. For example, if we license a plant in Wilmington, North Carolina, or we license a plant in Pennsylvania, or wherever we license a plant, we look at all of the things you are suggesting.

We look at the worst case, we look at the total of the ologies, we look at the accident considerations, and we give this review to those plants. To that extent anyone can review what we have done in this regard and see how we reached our conclusions and everything is referenced.

A good example of that is one like the Midwest Fuel Reprocessing Plant where we just issued a Final Environmental Statement and a Safety Analysis Report. Everything is in there. But to put up a model that would serve the industry, the averaging, a conservative averaging looked to be a good way to go, because if one reactor, for example, got a little advantage because it might have gotten its fuel from a mill which was slightly higher in effluent, another one got its fuel from one that was low — In other words, for this document an averaging looks realistic.

But every plant in the fuel cycle as it is listed goes through the very review you are asking about.

DR. STEINDLER: Let me mull that over and frame another question later.

Is it conceivable — I don't know whether this is a question for you or for Mr. Murray. Is it conceivable that [146]
people would assume that having defined the fuel cycle industry by this series of model plants that are connected by truck or rail or whatever, that from here on out the industry is going to be required to provide plants that follow these effluents and no others as a maximum?

If the answer is "no," I will back off very quickly.

MR. MURRAY: My answer would be that anything is conceivable, Dr. Steindler.

DR. STEINDLER: I didn't mean it in that sense.

MR. SMILEY: I think I see what you are getting at. What we reported was the industry today conservatively. In other words, if we were to look at the numbers from each plant, you would come up with lower numbers than we have here. We took a conservative point of view, and we haven't closed the door as to the future.

I might point out that that has come up in several comments that have been brought to us. We have seen industry and other Government agencies comment on the fact that we have made a rule. Now is this rule for all time? No, it is not; it is reviewed.

Our point of view is that probably in the order of a few years, maybe four or so, when we get more operating experience on the reprocessing plants, we will probably revise that.

Now we are working on as low as practicable, and [147] we do intend to come up with as los as practicable for all plants for the future. We have a contract with one of the National Laboratories now to look at as low as practicable.

Every new plant that we putup — Maybe this is more to your point. Every new plant that has been constructed that we make a licensing decision on is looked at on the basis of as low as practicable, using the best possible technology. And even in the backfitting of old plants coming up for renewals, this is a consideration.

Certainly we are requring that any plants that had been put up before NEPA use the equipments in that plant to its maximum capability. This is another consideration. So you can look to the future I think to see numbers come down, because the technology will improve and our regulations — We get so involved because we are looking at as low as practicable right now for every step in the fuel cycle.

Does that help?

DR. STEINDLER: Yes. That's fine.

DR. GEYER: I will go back then to referencing some pages and asking for clarification.

On page C-30, the first sentence at the top of the page, it there mentions the use of an annual flow —

MR. SMILEY: C-30?

DR. GEYER: C-31, the top of the page.

MR. SMILEY: Oh, yes.

[148]

DR. GEYER: By "annual low flow rate," what do you mean? Is that the low average year or is it the — I'm just not clear.

MR. SMILEY: It is probably the critical flow, but I would like to ask a member of my staff about that. I'm afraid I will have to look into that and let you know that later.

DR. GEYER: All right.

On page E-23, some more information with regard to dilution. There is a sentence just below the center of the page that says:

> "Thus subsequent dilution of the effluent by the receiving body of water is required to reduce the chemical concentration to these recommended levels for drinking water supplies."

It would seem to me to be desirable to discuss that matter more fully because the water may already be close to the limits permitted for drinking water supply. What would you do under those circumstances?

MR. SMILEY: If I'm not mistaken, I think that when we said we need a certain dilution or certain flow, like 600 cubic feet a second, I think it takes into account the concentrations upstream as well as uses downstream. Do you follow what I mean?

In other words, when we say 600 cfs, we indicate [149] there is a certain ammonia concentration in the water upstream so it does, to answer your question, take into account the level before we allow the plants to discharge.

DR. GEYER: Of course if you use an effluent standard, this problem disappears.

MR. SMILEY: Right. It disappears for us, it doesn't disappear for the people running the plants I'm afraid.

DR. GEYER: Going back to page S-29, the summary, you have referenced this survey to open pit mining, whereas in the future it appears that the major source of uranium ore is going to be underground mining. What will be the problem with regard to mine wastes when this change takes place?

MR. SMILEY: First I would like to say Yes, I agree with that observation, it looks like our reserves for the future will be more in the underground mines. We picked the open pit, because we felt it had the largest effect on the environment, certainly in terms of the overburden, the amount of land disturbed.

DR. GEYER: During mining this is true, but if in fact the mine wastes themselves are put back in the pit and it is graded over and planted, this sort of thing, maybe the long-term effect is not as much as having these tailing ponds at an underground mine.

[150]

MR. SMILEY: I think that could be quite right. When we mention that, we don't put a time limit on the amount of time it would take to put out another edition of this thing. We want to keep it upgraded.

I would say if we were doing this several years from now, we might well switch and say now in the survey the mine is an underground mine. I think that is very well taken.

DR. GEYER: On page S-32 there is, in the middle of the page, a statement that:

> "Two curies of activity per annual fuel requirement are discharged in the tailing solution and thus are returned to their point of origin in the ground."

This may be true in the sense that they are returned to the ground, but not necessarily to the point of origin.

MR. SMILEY: I think that that is careless wording. I agree with you.

CHAIRMAN PAGLIN: Mr. Murray and Mr. Smiley and Dr. Pitman, as you can see, theBoard has some further questions of the Staff, and we would like, in consideration for the other participants who are on our schedule this morning, in order not to run too far behind, we would like to resume our questioning of the Staff at the conclusion of the other oral presentations, probably either at the end of today or [151] perhaps the end of tomorrow.

MR. SMILEY: Fine. No problem.

MR. MURRAY: We plan to be here throughout the hearing, Mr. Chairman.

CHAIRMAN PAGLIN: Fine. Thank you.

All right, then the next oral presentation is to made by the U. S. Environmental Protection Agency, Mr. Rowe.

STATEMENT OF W. D. ROWE ON BEHALF OF THE U. S. ENVIRONMENTAL PROTECTION AGENCY

MR. ROWE: Mr. Chairman, Members of the Board:

I am William D. Rowe, Deputy Assistant Administrator for Radiation Programs of the U. S. Environmental Protection Agency. I am pleased to present the views of the Environmental Protection Agency on the important subject of this hearing.

Since we have submitted detailed written comments to the AEC on the Federal Register notice and the Survey

Report, I will restrict my remarks to highlights of that review.

The hearing represents, we believe, a recognition of the importance of considering the environmental impact of other components of the uranium fuel cycle in making decisions relative to nuclear power. Such impacts will occur in varying degrees when nuclear power generation capacity commitments are made and knowledge on the extent of these effects is essential in evaluating alternative sources of energy with **[152]** their differing potential effects on man and his environment.

We believe that a better knowledge base for the decisions required on the impact of the fuel cycle can best be achieved on a generic basis rather than by a case-by-case examination of individual reactors. For this reason, we support the principle of evaluating the impact of the uranium fuel cycle on a generic basis.

The ultimate aims of this approach should be to compare all energy cycles on a cost-benefit basis and to pursue national decisions on which power systems are best to satisfy the country's demand for power. The information being developed in this hearing is important to these goals.

Ideally, we believe that in evaluating the environmental effects of the fuel cycle as related to a reactor, such effects, to the extent possible, should be related to the specific fuel cycle plants that support a given reactor. We recognize, however, that at present and for the presently foreseeable future it would be impracticable to adopt such an approach because the patterns of the industry are changing and the knowledge base of the environmental effects of various components of the cycle is being added to as technology changed. This condition also argues, we believe, for the

generic approach used by the AEC in its Survey Report which supports the proposed rulemaking.

Neither of the two alternatives proposed in the **[153]** rulemaking specifically addresses the problem of periodic review in a specified time period. In view of the expected growth in nuclear power and the development of new and improved technology, we recommend that the AEC make it clear that it does not intend by this rulemaking action to foreclose future consideration of fuel cycle impact as related to reactors.

This assurance can be given by stating in the rule that the environmental effects of the total fuel cycle will be periodically evaluated and updated as new information is developed. We believe a period of two years should be specified in the proposed guidelines as the timeframe over which they would be effective.

Given such assurance we would recommend that Alternative I be adopted with the understanding that the first reassessment would take place within that two-year period. In this regard we can accept on a provisional basis the current Survey Report as providing adequate consideration of the environmental effects of the present uranium fuel cycle for purposes of the rulemaking.

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AFTERNOON SESSION

2:00 P.M.

CHAIRMAN PAGLIN: Will the proceeding come to order? The Board has determined and with the kind cooperation of Mr. Roisman, in order to accomodate Dr. Pittman, we would like to put some Board questioning to

Dr. Pittman at this stage and then we will recommence with Mr. Roisman's group.

So the Board Members have questions of Dr. Pittman at this time. Dr. Steindler?

DR. STEINDLER: There has been some discussion and you alluded to it in your testimony regarding our present ability, the present ability of the nuclear industry to retain high level wastes in a safe fashion. Is there anything that your studies have shown that indicates that at this point, as apparently practiced in the industry, the retention of high level wastes is a real problem?

DR. PITTMAN: There is nothing that I can see with regard to the commercial high level wastes, either from the point of view of what the industry will have to do under the regulatory scheme, or what the AEC will have to do, once the solidified waste is delivered to them, to us.

The possible retention for up to five years in stainless steel tanks, as an acid solution is the type of thing we have had at Idaho Falls for of the order of ten years, and the type of thing we have been doing in stainless **[200]** steel tanks at Idaho Falls for ten years, retention in acid solutions with no problems at all.

The next step the industry has to carry out is if they decide to wait five years and retain it as acid solution, to solidify the material, there are several methods of solidification, the method that was chosen by the first company who is going into business this year is that of using the fluid bed calcination technique, which again is one that has been demonstrated at Idaho Falls for ten years, and they then put that into cannisters and store it in basisn of water.

All of this is under the license control of the regulatory group. The basin storage is similar to the type of storage that is used at reactors for storing spent fuel elements that have essentially the same fission product contents, they have a lot more, has more plutonium than uranium, so it has a problem of material that we don't have in the wastes.

The sealing by ten feet steel cannisters is certainly no breakthrough in technology, it is something that can be done and has been done in many industries for a long period of time. The transportation of the spent wastes in the casks of the same type that have been used to transport spent fuel in my opinion is a demonstrated technology.

And the engineered surface storage of these wastes once delivered to the Commission is purely an engineering **[201]** application of technologies that have been known for many years and that have been used by the Commission in not waste storage, because in our previous systems we used other methods, but in my opinion there is no technology that needs to be developed in order for the whole storage of wastes from the time it is generated and it is kept in manageable sized containers, from that point on, to the time we get it and store it in the engineered storage in managably sized retrievable, monitorable, maintainable containers.

The engineered storage, you have heard the words, we have designed for one hundred years, that is purely meant to show that the basic basins, the facilities in which these materials will be received and stored, are built with the latest technology for concrete and steel, and will certainly last a hundred years, probably a lot longer with adequate maintenance of the facilities.

We do not necessarily expect a given cannister delivered to us in 1983 to not have some corrosion problems in one

hundred years. They can quite easily be overcanned or recanned or maintained and we have techniques built into the engineered storage facility that will allow us to detect when there is a leak before it becomes a major leak, and to identify which tank is leaking, to take it out and repair it or repackage it.

DR. STEINDLER: Then the picture that I think I am
[202]
beginning to see here is that at the moment it appears that the high level wastes are retainable in the individual reprocessing facilities, and that the engineered storage area will consolidate the waste surveillance and handling problem into one site and that is really its major contribution, not the development of some new technology.

DR. PITTMAN: There is nothing new being developed in the engineered storage facility. We are looking at better techniques of removing the heat, more efficient techniques of removing the heat than maybe used before. But it is purely an engineering application of known technology we are using.

And the idea of bringing these together at one site under the auspices of one agency, namely the Atomic Energy Commission, has to do more with the assurance of continued control for whatever period of time is necessary.

DR. STEINDLER: Thank you.

CHAIRMAN PAGLIN: Dr. Geyer?

DR. GEYER: Dr. Pittman, I refer to Table H-1 on page H-3 of the Survey Report.

DR. PITTMAN: Yes, sir.

DR. GEYER: There appears there numbers of shipments per model LWR annual fuel requirement. The question is will these remain constant with time over the years?

DR. PITTMAN: Per annual fuel requirement as it is now known, they will remain constant for the waste.

[203]
There are several factors which might make it fewer shipments, because we are assuming that the waste material in the can, has a very low density, and we can only get the equivalents of 3 tons of fuel reprocessed, the waste from three tons, into a can.

We have under development methods of solidification which might cut that down by a factor of 3 or more in the amount of wastes that you can get into a can. If it makes any sense. We feel that the packaging and shipping and storage of the low density material that is being produced by the first reprocessors going into business is perfectly safe, but there may be some economics in being able to get more of this material into a given can, which would cut down on the number of shipments, per year, per reactor.

DR. GEYER: I assume then that one could make an estimate of the number of model LWR's or the equivalents of them that would be present 30 years from now, and that would be the number of, multiplied by one, would be the number of shipments of high level wastes?

DR. PITTMAN: I don't have the figures in my head for the number of shipments we are assuming will have to take place per year from the economy and, the nuclear economy in the year 2000. I do remember a figure, I will be glad to submit a corrected figure for the record, but I do remember a figure that in the year 2000 there will be 8,000 cans [204] delivered during that year, if I remember the figure correctly. In other words, the slope is going up very rapidly towards the end of the century.

DR. GEYER: But it would be desirable to have in the record some of the long term estimates, just to see what the scope of this problem may be in the future.

DR. PITTMAN: This would be for the entire economy?

DR. GEYER: That is right.

DR. PITTMAN: We have the figures. I can get them for the record.

DR. GEYER: It would be nice to have them for say 25 and 50 years, just to see what they might look like.

DR. PITTMAN: Yes, what we are assuming is this one facility we build will handle everything generated through its end of the century. And then there would have to be more facilities, maybe expansion of this one, maybe new facilities or maybe other techniques would be used by that time.

DR. GEYER: My next question bears on the same problem in a sense. There will certainly be a considerable amount of this material in transit and since the cell storage under water of the high level waste is apparently being considered to be an interim measure, to be subsequently replaced by permanent resolution of the storage problem, why **[205]** not leave the wastes where they are?

DR. PITTMAN: This is one of the things that is being given consideration, not so much from the standpoint of leaving them where they are in the basins of the reprocessor, but rather in the selection of sites.

One of the factors we are looking at in the selection of sites is does it make sense for us to have several government owned and operated repositories, right adjacent to or near the location of the reprocessing plants, so the initial

shipment of this waste while it is at its hotest, namely after ten years, would be minimized?

DR. GEYER: Why not right on the site?

DR. PITTMAN: It is possible right on the site, under government control. We are still assuming government control is necessary. This is being looked at and evaluated against a single repository. The early indications seem to give the economics in favor of one single repository versus a series of small ones, but that is only economics.

DR. GEYER: Thank you, sir. That is all.

CHAIRMAN PAGLIN: Thank you very much, Dr. Pittman.

DR. PITTMAN: Thank you, sir.

[206]

CHAIRMAN PAGLIN: We may have some further questions for the Staff, as I indicated earlier today, at the conclusion.

Thank you, Mr. Roisman, for your cooperation.

We will now proceed with you. Can you tell us the order in which your witnesses will appear?

STATEMENT OF ANTHONY A. ROISMAN, on behalf of the Consolidated National Intervenors and the Union of Concerned Scientists.

MR. ROISMAN: My name is Anthony Z. Roisman, Mr. Chairman, and I have a panel here today on behalf of the Consolidated National Intervenors and the Union of Concerned Scientists. With me is Dr. Henry W. Kendall, who is a nuclear and high energy experimental physicist and Professor of Physics for the Massachusetts Institute of Technology, and Dr. Edward P. Radford, Professor of

Environmental Medicine, School of Hygiene and Public Health, Johns Hopkins University.

Also with me is Mr. Jim Beaverman, a law student at George Washington University Law School, who is working with us under an environmental program that is run at George Washington University.

I will begin with a very brief presentation on some of the legal questions, and then Dr. Radford will speak and then Dr. Kendall.

Because Dr. Radford will not be available tomorrow **[207]** due to a substantially earlier commitment, I would appreciate if the Board would ask questions of Dr. Radford following his presentation, and, because I can be here tomorrow, if necessary, if the Board would not mind postponing questions for me until tomorrow morning. If they have questions for me I will be glad to return for that purpose.

I should make it clear that as a lawyer, of course, I have no technical expertise, and purport only to talk about legal situations and, to some extent, to give you a brief outline of where we are going.

CHAIRMAN PAGLIN: All right. We will go ahead on that basis, Mr. Roisman.

MR. ROISMAN: Thank you.

I think that this hearing today is an extremely important event in the continuing discussion with respect to nuclear power generation. It is quite possible that this is the beginning of the end of the further development of fission nuclear power in this country. I don't say that from a technical standpoint; both Dr. Radford and Dr. Kendall and a number of the other people who have been associated with our

organizations have raised serious and important questions involving nuclear safety which of course must be resolved prior to the licensing of nuclear power plants.

But even assuming that the optimistic view of some that those safety problems can and will be resolved, there **[208]** is the continuing question as to whether or not the public, once it hears the real story about nuclear power, will turn it down.

I think that the past actions of the Atomic Energy Commission, the nuclear industry, and the utilities have to a large extent created a potential for public reaction against nuclear power which will end the fission nuclear program. We are all aware of what those secrets have been in the past. A congressionally created Advisory Committee on Reactor Safeguards continues to keep its meetings closed to all but utility and vendor and regulatory staff personnel. The Atomic Energy Commission continues to take subjects as important as nuclear waste disposal and treat them in a cavalier manner that we find them treated in this environmental survey.

They continue to raise the issues of the environmental fuel cycle in the most obtuse manner, and subject it to this type of legislative hearing, while refusing to face up to the fact that the public demands the right to cross-examine and to have discovery on these issues, that we are not satisfied with Mr. Pittman's well intentioned, but, we think, not at all well explained position with regard to the ability to handle nuclear wastes for hundreds of thousands of years. He has in his own words referred to it as a program of perpetual management.

[209]

I must say, as a former philosophy major in college, I have some concept of the term "perpetual." I think the

public deserves theright to ask the question, What does that mean?

Dr. Ralph Lapp has pointed out if we should have the incredible nuclear accident, namely, an emergency core cooling system failure following a loss of coolant accident, it is quite possible that the public's reaction to that event would be a moratorium on nuclear power for a hundred years.

I posit when the public finds out that nuclear power plants create a product, not in nature, a product which has a half-life of 24,000 years, and that remains lethal for hundreds of thousands ofyears, that it may very well say to this country, We are ready to find the alternative, and we don't care about thequestion of safety, because you have led us down the garden path so often, you have hidden the facts from us so frequently, that we do not believe you when you tell us that this generation and the generations to come will be safe for ever from something which we need not ever face if we simply do not create it in the first place.

Perhaps the best example is to look at the press statements that come from the Atomic Energy Commission. And many of you have probably seen that great poster with Johnny's addition on it: Four truckloads of plutonium heat
[210]
New York and light New York City for a year. How much plutonium do you have at the end of the year? Five truckloads.

Johnny's mathematics doesn't tell you how much nuclear waste that is not useable in that reactor that you have at the end of that year, it doesn't tell you how much longer you are going to have to control that waste. It's that kind of false addition which has made the public extremely skeptical about nuclear energy.

And if nuclear energy is capable of fulfilling its promise, there is some doubt as to whether or not the public is prepared to accept it now that they have come to this juncture.

It is not surprising that the environmental survey of the nuclear fuel cycle has come out at this time. While we are not concerned here with the motives of the Atomic Energy Commission, but rather with their actions, we do think it is important to note that as long ago as when the Calvert Cliffs decision came down the Commission was put on notice by environmentalists and others that their failure to treat the environmental fuel cycle in individual licensing proceedings was a major error, comparable to the same errors that produced the Calvert Cliffs decision.

Now, some year and a half later, the licensing proceeding which was chosen by intervenors to raise that issue, Vermont Yankee Nuclear Power Company, is drawing to a
[211]
conclusion, and the New England Coalition on Nuclear Pollution and the National Resources Defense Council stand ready, if a license is issued, to take that issue to court.

We think the Commission is fully aware of that. And that one possible reason for holding this hearing at this time was in order to have before the court at the time the hearing on the real issue is presented, something that will make the Commission look like it is moving at better than a funeral rate, and it is not making a complete mockery out of the National Environmental Policy Act.

In that context, what this hearing represents is a form of ECCS, emergency core cooling system, and it should not be in any way confused with an adequate environmental study of the nuclear fuel cycle. It is not. It doesn't even purport to be, although the cover, as Dr. Steindler pointed out, does to some extent mislead us as to whether or not it discusses all of the issues.

One of the most important factors that we think is lacking in this report is the failure to distinguish between design objectives on the one hand and performance on the other. The history of the Atomic Energy Commission and the atomic energy in general has been one in which design has rarely been achieved and that performance has represented a significantly different figure.

Let's talk about a few examples that I think will **[212]** point up this point.

First, we were told earlier today, and it appears in the report, that we can anticipate that one-third of the core of a thousand megawatt nuclear power plant will be replaced each year. And from that the entire environmental survey of the nuclear fuel cycle begins.

I am informed that the Regulatory Staff has taken the position in Point Beach Unit No. 2 that in order to cope with the inability of the Staff to now analyze the problem of fuel densification, that the Staff is recommending in Point Beach Unit No. 2, close to a thousand megawatt reactor, there be full core replacement each year; since they don't know what will happen to fuel densification they would rather remove the rods and assume they are all crumpled.

I don't mean to quarrel with the premise; I merely point out that represents the tripling of the amount of fuel going from power plants if that unit becomes the standard.

In the waste disposal area, the history has been abysmal. Mine tailings were used to put into the foundations of homes in Colorado. We have had problems with leakage at Hanford. At the reprocessing plants the releases of Iodine-131 and Iodine-129 were grossly underestimated, and re-evaluations are having to be done.

In another specific example, we find many power plants in this country are having to now be re-evaluated to determine **[213]** whether or not the steam lines and other high pressure water lines ran so close to the building that had the control room in it, if there were a postulated break of those pipes they might wipe out the control room. Two plants, Prairie Island and Kewaunee plants, may in fact have to be totally redesigned because of the problem.

Significantly it was not the Atomic Energy Commission which discovered the problem, but an anonymous letter sent to the Commission advising them of it.

These events are not designed to instill confidence in the public or to make us believe that the way to evaluate the environmental fuel cycle — the nuclear fuel cycle's environmental impact is to begin with design objectives which we don't necessarily know can be met. We have been told that this report represents an extremely conservative evaluation of what will actually happen at the site. Yet in the presentations submitted by Babcock and Wilcox, on pages 2 and 3, they tell us that they want to be sure that it is made clear that the modeling approach to the fuel cycle industry is "not intended to represent any specific facility and should not be construed or applied as operating criteria or limits for specific fuel cycle facilities."

It is this type of "Now you see it; now you don't" in which we do our environmental analysis based upon one standard and set criteria at a different level altogether, that **[214]**
continues to make public confidence in nuclear power fall.

Another aspect of the fuel cycle report which is lacking is an objective analysis of the question of accidents. In our opinion the entire accident analysis should have in-

cluded the types of assumptions which Dr. Steindler referred to earlier this morning, and some basis for reaching those particular assumptions.

In our presentation today we will begin to discuss the question of what is the credible accident in the nuclear fuel cycle, and how does one go about determining what constitutes credible and incredible.

I need not stress to all of you the significance of the terminology "credible" and "incredible." It represents an extremely important line that, once drawn, distinguishes between those things against which plants are designed redundantly to cope with, and those things against which no designs exist.

If an accident is incredible, the plant has no designs to cope with it, unless they happen to accidently be there. If the accident is credible, redundancy is required.

The drawing of that line is extremely critical. And yet the fact remains that today no reliable, competent figures exist to determine the probability of accidents, or any way to determine what we should use as the criteria for [215] setting the credible and incredible line.

If we continue in the present procedure it is our position that what will prevail is a situation in which there will be no legally sufficient environmental survey of the nuclear fuel cycle. In our opinion the alternative suggested in the Commission's Notices of Hearing do not meet the objectives of the National Environmental Policy Act or the Commission's own responsibilities with regard to the radiat-on dangers from the operations that the Commission controls.

[216]

It is not a substitute for the review required under the National Environmental Policy Act to hold a legislative

type hearing and produce a document which contains figures which are then to be introduced into the record of an adjudicatory hearing, namely the licensing of nuclear power plants, and are not subject to discovery or cross-examination.

Such a route would allow the Atomic Energy Commission or any other agency that holds adjudicatory hearings to hold legislative type hearings to get all of the important numbers and then in adjudicatory hearing, in which the numbers would be installed in a pre-determined place, in a pre-arranged report.

We feel that the only possible solution is to have some type of a full generic hearing. The biggest single problem is that we are discussing the question of the environmental impact of the nuclear fuel cycle in the context of the continuing licensing of the plants which produce the problem.

We are not having an opportunity to consider whether or not those plants should ever begin to operate at all. This morning we heard from the Atomic Energy Commission witnesses that it might be as late as 1983 before the first interim storage sites would be needed, and from that the inference is drawn that therefore there is nothing to worry about, fellows, it won't be 1983 until we actually have to [217] have one running. The problem is it is in 1973 we are producing the wastes, and if in 1983 we discover that the dream of the adequate interim storage site is like the dream that Lyons, Kansas had a perfect salt mine, there is nothing we can do about it, because the wastes are already there, ten years old and ready to go.

And the issue, the issue that the Commission refuses to face up to is can you continue to produce the wastes, can you continue to produce the reprocessing plants, can you

continue to do the mining without asking the question of whether or not in the first place we should be pursuing this course of action.

We suggest, therefore, that an alternative 3 be adopted, and that that alternative that the Commission convene a full generic hearing on the question of the nuclear fuel cycle, which is subject to full adjudicatory rights, that a notice go out throughout the country, participants in individual licensing proceedings, that this will be the adjudicatory hearing on the question of the fuel cycle and that the results of this hearing will be put into environmental impact statements as appropriate.

We discuss in much more detail in a legal submission which we are making shortly the exact mechanism for this type of hearing. But, Your Honor, the salient points are, one, it is adjudicatory, and two, once it produces **[218]** an environmental impact statement and board findings, it should be subject to periodic updating. Now you will note in some of the submissions of people who might have been considered to be on the other side from us in this proceeding there have been suggestions to the effect that something like this be done.

But let me stress that the line that distinguishes us from those others is that we continue to insist upon the Administrative Procedures Act protections of discovery and cross-examination. No subject is more needy of those procedural rights than the subject of the fuel cycle. Long suppressed in terms of public exposure, now kept at a low key level in this type of legislative hearing, it is a subject which demands investigation.

We note that the proponents of nuclear power who have been frequent and vociferous in their support have been

significantly silent at this hearing, making 15 and 30 minute presentations, with the exception of the Atomic Industrial Forum, which is not taking a position on the merits of the two proposals.

We do not think that is accidental. The subject is one of great embarrassment to the industry. It involves the critical question, do we want nuclear power or do we not? And we feel that the past performance has been an unwillingness on the part of the Commission or the industry to openly **[219]** discuss this subject.

Until we can cross-examine and discover with regard to it, the subject still remains essentially a closed book. Thank you.

Dr. Radford will now begin his discussion. We have distributed previously the consolidated National Intervenors Statement with respect to the oral presentation, which outlines some of the points that Dr. Radford will make. We have also distributed this morning to the Board an outline that is in more detail of his comments.

He will be available for questioning at the conclusion of his remarks.

Thank you.

STATEMENT OF DR. EDWARD P. RADFORD ON BEHALF OF THE CONSOLIDATED NATIONAL INTERVENORS AND THE UNION OF CONCERNED SCIENTISTS.

DR. RADFORD: Members of the Board, I am Dr. Edward P. Radford, Professor of Environmental Medicine at Johns Hopkins University, in the School of Hygiene

and Public Health. I welcome the opportunity to appear with the National Intervenors and the other groups not because in all details my position has been identical with theirs as just in some detail has been expressed by Mr. Roisman.

Before I begin I would like to make my position clear, but I do share some or many of the concerns. It has **[220]** been my experience that throughout my contact with the whole issue of licensing of nuclear facilities, that some overall view of the environmental impact of these developments be taken.

My attempts to do this at the various hearings that I have participated in have been uniformly negative, uniformly struck down as not responsive to the particular hearings. So that what I am saying today comes from a long series of episodes in which I have attempted, unsuccessfully, to bring these matters to the attention of the public and particularly to the licensing agencies.

Now, to begin with, my position with regard to the development of fission reactors is somewhat different from that expressed by Mr. Roisman and I feel it is appropriate to point out that we do not insist in our organization on uniformity of opinion.

My feeling has been that in many ways the development of fission energy has come at a very opportune time, that, in fact, our need to displace fossil fuel, such things as coal and oil as fuels, is urgent and is pressing. On the other hand, I also believe that, as I have indicated in the outline, that the whole process has been very much oversold in the sense of both economic and in terms of the alleged lack of impact that this will have on the environment.

I would like to say just a word about the availability **[221]** of nuclear fuel. I have in the past in public expressed the opinion that breeder reactor program is critical to the development of the fission industry.

In this regard I am in no way different from former Chairman Seaborg, and all of the rest of the commissioners, President Nixon, et cetera. It stands to reason that unless we have an adequate supply of low cost fuel for these reactors in 30 or 40 years, then obviously we will not have a nuclear program.

And in effect then one must say what will be the environmental impact of the breeder reactor which must come on line as quickly as possible, in order to provide the available fuel. I don't believe that at this time it is worthwhile to discuss this in detail, but I feel that as far as the safety features are concerned, about which I will not speak, the safety features of the breeder reactor remain very much in doubt, and therefore the developments must be done on a much more cautious basis than has been done for the light water reactors, and for that reason may be delayed, in fact in my opinion it is unlikely that before the year 2010 and based upon my evaluation of the industry, it will be that long before we have a significant commercial breeder reactor program that will be available, if ever.

So much then for my position with regard to the development of the industry itself.

[222]

With regard to the information problems that have arisen, to which Mr. Roisman referred briefly, I would like to point out that it has been, as one has attempted to inform himself as much as possible, and in a responsible way, it has been a frustrating experience to attempt to find out what in fact really happens.

Too often its reaction has been, and it was such at the preceding hearing, in the as low as possible hearings last summer, too often the attitude has been, well, you don't know what is going on, therefore how can you criticize it.

I submit, Gentlemen, that it is not the responsibility of the people who have many other responsibilities besides this to go and ferret out the information. Quite the contrary. I think the whole record should be open, and it has signally not been laid open. To give you one specific example, in response to questioning last summer, I was asked whether I was aware of the quarterly reports of the Dresden Nuclear Power Reactor and since I said I was not privy to that information, it was made available to me.

But was it made available to me? The material I received had deleted all of the scram records, it had no indication of the occupational exposures of the workers in the plant. In fact in one case it simply gave the release data only, part 6 I believe of that particular quarterly report.

[223]

Now it is my understanding that these quarterly reports are part of the public records of the plant. And the question is why was this deleted when it was brought up as an issue that I was uninformed on? Especially important I think with regards to the environmental effects is that very little in the way of actual monitoring data in the field have been provided from operating reactors.

By and large all of the radiation doses that are being expressed for the public are calculated doses. I submit that the industry is only just now developing, that there are enough questions in how you monitor, what you monitor, et cetera, that there should be a much more vigorous effort made by someone, and I will just say a word about that, but made by someone to actually monitor what comes out of

the reactor, not simply take the words of the operating plants.

They may be right, but they may be wrong. Now the someone who should do this, as you know with the Northern States opinion by the Supreme Court, the whole matter has been tossed back to the AEC. In other words, the states feel that they are preempted from any significant inputs into the licensing, or even to some extent the monitoring programs.

Certainly they do not have the resources under our present allocation of funds to do this by and large. So that I think that this is an issue that is relevant and when I discuss later the questions of what actually has been **[224]** the operating experience, there are gaps in our information, unquestionably, and it is a question of whose responsibilities is it to fill in this kind of data.

To give an illustration of the fact that there can be major differences, in the extent of the environmental impact with a single plant, in the testimony last summer at the as low as possible hearings, I gave some estimates of what I thought the Dresden Nuclear Reactor would be causing in the way of a radiation dose if they were operating at 90 percent capacity for a year.

The company, the General Electric Company, made other estimates. I later pointed out that in a letter from Lester Rogers, that the AEC measurements differed from the company's by at least a factor of about six, if not more, higher.

In other words, field measurements carried out by AEC had indicated the company's estimates were decidedly low. This is the kind of thing that keeps popping up in this.

Of course fundamental to all of this is what has been the operating history of the plants.

[225]

Now it is significant that in the 1971 AEC releases on what the radiation emitted from the plants had been for the first time, at least to my knowledge, the rated thermal capacity of the plant and the actual thermal production of the plant were given on the table with the radionuclides, so for the first time you could calculate what the operating percentage was and then if you were inclined to do so, you could say, well, if they operated at 90 percent of capacity, this is what the radiation releases would have been.

Obviously, the utilities are doing their level best to make them operate at 90 percent of capacity. So here again is a way in which you can extrapolate. But all too often in the past it has been impossible to find the actual operating experience.

Now I turn finally in my general comments, to the issue of whether the evaluation of the health risks have been realistic or not. I first had experience with this in 1948, as a radiological officer at the Sandstone nuclear bomb test held at Kwajalein and Eniwetok. We were told in a briefing before the shot that there was essentially zero probability that there would be any significant fallout on the islands on which the suppoerting personnel were living, namely Kwajalein. One item, of course, was the prevailing wids were not in that direction; two, they had [226] already figured the meteorology in advance before they went with the shot, et cetera. Needless to say, we had rain out on Kwajalein, such that on the canvas of the tests, we were recording with our Geiger counters, which was essentially beta gamma, approximately 5 mr per hour, which is not a negligible radiation dose. This was my beginning intro-

duction into the ability of experts to predict such things. There were some other things such as the extent of stratospheric penetration, which was also wrong.

Coming up to the more recent past, Mr. Roisman has already summarized some of the things that have concerned me in the past, where in fact the Atomic Energy Commission failed to anticipate a problem. I think the fallout problem from I-131 is a classic; they weren't even measuring it until it became apparent it was one of the major routes of exposure to the population. Similarly, the fact that tritium is a fission product was not discovered until 1959, long after the first fission.

I don't mean to harp at these, because I think, after all, we are all human and we don't necessarily know everything, but I am merely pointing out that the image AEC has project consistently in the last three years is "We know all about everything, and we are telling you it is fine." I am saying the record does not necessarily bear this out. That perhaps is one reason we are having these hearings.

[227]

Now with regard to the question of the linear nonthreshold dose response relationship for radiation effects on man, we have heard a lot about this; I have expressed myself vigorously on this point and I had occasion to do so as a member of the National Academy of Sciences Committee reviewing the biological effects of ionizing radiation. And that report has now been issued, and I see no evidence —I have a copy of it here, the effects on populations to exposure to low levels of ionizing radiation. I see no evidence that the contents of this report, which is certainly available, have been taken into account in looking at the risks to the human population.

Now, the fact of the matter is, as I become more involved in the question of the safety or non-safety of nuclear

facilities, was that it was apparent that the thinking of the regulatory agencies, by and large, was not to accept the linear nonthreshold dose response curve. In other words, they made the assumption that such things as the effects will be so small as to be nondetectable; therefore, we don't need to worry about them, or you can't measure the increase in cancer rate; therefore, it is not important. I submit that that is a mistake, and in fact, then, by and large, the attitude has been not to take this seriously.

Now it turns out, and I think on any reasonable **[228]** reflection, any scientifically knowledgeable person would realize that this is an extremely fundamental question that we are addressing when we look at an environmental agent which at any significant increase is thought to produce an effect on the human population.

We are in quite a different position than we are in regard to a lot of our environmental effects. We may turn up many chemicals which have the same process and we will have exactly the same dilemma. In most cases these chemisals can similarly be deleted from our industrial process, never used. But unfortunately radioactivity is a necessary concomitant of nuclear power developments and, therefore, we must live with it in context.

Now I feel that the situation has improved in this regard and the as low as practicable hearings that were held last summer were a reflection for the first time the AEC began to take seriously the issue of how much ought to be released, what risk to the public ought to be an acceptable risk, which is the tough problem we have to try to reach an answer to.

Now, unfortunately, in those hearings or in the proposed changes to 10 CFR Part 50, that they were addressed to, I feel they over-reacted. They were recommending stan-

dards that were so strict that they would almost inevitably be unmeasurable and, therefore, unenforceable. I say that is **[229]** almost as bad a situation as having standards that are clearly much too high. I will come back to this point by looking at some of the issues as we go along.

I would now like to turn myself to some of the environmental impacts of the entire fuel cycle that I see as of critical importance at this time. The first point has to do with uranium mining operation. The environment of the mines is just as important as the environment outside the mines. There is a tendency on the part of many people to say that environments are only what you can go outdoors into. That is not true. Houses are environments, work places are environments, and of course, we spend a substantial fraction of our lives in these environments, too.

Therefore, the mine environment is an important one for the miners. Exposure conditions in the mine are from the radon daughters, the radon comes into the mine air from the surrounding rock and waste water, et cetera, and they decay to short-lived alpha emitting daughters, which generally adhere to particles and are inhaled.

The BEIR report I referred to goes into considerable detail in updating the available information on the mining experience in Colorado and elsewhere. And I have since received some additional information from Sweden which is also very interesting. And very nearly confirms the same kinds of dose response curve that has been observed in
[230]
Colorado and in Newfoundland. The evidence to date indicates — and I can put it in these terms — that the projected risk to the miners if the current standard of four working level months per year is adhered to, and that was fought vigorously by the industry, and to a large extent by AEC

as well, is that the increased cancer rate, lung cancer rate to the miners, they will have an increased risk of approximately 250 percent above the other working population not so exposed.

Now the question is, is this an acceptable risk? Are we requiring miners to accept this risk in order to work in the mines? I might say that the assumption I have used here is that they work 30 years in the mine, from age 25 to 55, let's say. If we reduce this standard to one working level month per year, which I believe according to the hearings would be very difficult to achieve in most mines, then we might have only an increased risk of 65 percent.

Now it has become apparent in looking at the data that the risk is increased proportionately both for smokers and nonsmokers. In other words, because a smoker has approximately 10 times the cancer risk as a nonsmoker from lung cancer, then in the miners, the smoking miners have approximately 10 times the risk that the nonsmoking miners do. But the proportionate increase related to the general population would be expected to be the same.

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One way, then, perhaps to reduce the risk to these miners, is to hire miners, only miners who don't smoke. I consider this a highly unlikely event, because in the first place, it is almost impossible to enforce. If you were invading the privacy of the individual's own home to see if he smokes or not, and I don't think you can enforce it. So I think we have to begin on the assumption that it is likely a substantial fraction of the mining population is going to smoke, whether we like it or not.

The second way in which this might be able to be dealt with, of course, is to use filtered air, use respiratory equipment. A close-fitting face mask has never worked in any

mining operation, or in any industrial operation that I know of. Men doing heavy work simply cannot tolerate the increased work of breathing that a mask respirator has. Therefore, they take them off. So you have no hope there.

The third mechanism has been to develop a portable flow-through system, with an overline hood. This is cumbersome and very likely would have the same fate, but it is at least worth a try.

Another method obviously is to put the individuals on short shifts and in this sense, we would be in very good company, in that this is the way in which the AEC, or other nuclear facilities, deal with the problem of occupational **[232]** exposures elsewhere. If the individual receives his 5 rem dose, he simply is shifted to other work for the rest of that year. At least this is my understanding.

So we do the same in meeting these standards. May I point out that the current standard of four working levels per month, we translate into a dose of approximately 20 rems per year to the bronchial epithelium. This is well above — there is no real standard for the bronchial epithelium, but in terms of cancer risks in males, the bronchial epithelium is the most significant organ in the body, more so than bone marrow.

So if you are comparing it to the total cancer risk from whole body radiation, you get about 80 percent of it in the lung cancer situation for males.

Finally, there is the issue of using only open pit mining, which eliminates this problem. I am not able to determine whether this is economically feasible or not. I believe the document we have before us says that approximately 50 percent of all mining tonnage is done by open pit mining. Therefore, we will have to worry about the environmental

impact of that in another sense, not in terms of the occupational exposure in the mines.

In my opinion, then, in conclusion of this section, I would merely point out that the present standards for exposure of miners in underground mines to radon daughters is [233] too high, that we are asking them to accept to grave a cancer risk on humanitary terms, and I don't believe if the miners and the unions really understood what this meant that they would,either.

I am not going to say a great deal about the environmental impact of the residues and so on, because this has been covered fairly well elsewhere. I have really nothing much more to add. In the interest of time, I will move on. I have just raised the issue of occupational risk from radiation exposure in the mines. But this is a general problem throughout the whole nuclear fuel cycle. In other words, everywhere you have one of these facilities, you have workers. And these workers may have to enter areas that have relatively high radiation fields.

Now I have made some calculations on the risk estimates to the working population based on my somewhat modified version of the risk estimates that have been expressed for somatic effects in the report. I take full responsibility for these calculations; they are not necessarily derivable from these. At least one of the members of the Board knows I submitted my model to the as low as practicable hearings last year on how I achieved these estimates.

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When we consider high dose rate radiation, that is relatively sudden dose, which might occur for example in the case of a welder going into a reactor in order to fix a weld, and we have heard from the Consolidated Edison of New

York that they had one such episode recently where they had to use 700 workers.

At high dose rates, five rems per year for 30 years, there would be an increased risk of cancer of 55 percent in females, and 40 percent for males. This is overall cancer risk for all cancers. In addition, in the females, if the female were exposed to this radiation dose at a time when she was carrying a fetus, the risk of cancer to the fetus would be 130 percent increased.

At low dose rates, that is day in and day out accumulation of dose, the corresponding figures would be reduced by a factor of five. I do this based on estimates of John Storer of the Atomic Energy Commission, with which I agree.

That is the effects, the somatic effects of radiation, are dose rate dependents when you are concerned with low LET radiation, that is gamma x-rays and most beta. That would be the principal occupational exposure in most cases. There the factor then would be an increased rate of about 11 percent in females, and 8 percent in males. But the dose, the effect on the fetus, if it is given over the entire [235]
pregnancy period, would still be the same. Now if you require female workers in the plant or in any facility to cease work in the plants as soon as she was aware she was pregnant, we would not necessarily eliminate these problems.

First, with regard to the high dose rate, this does not matter when that occurs. If it occurred during the first two months of pregnancy, when women characteristically don't know whether they are pregnant or not, under those conditions you would still have the same risk.

But if you had the progressive or the low dose rate effect, then if the woman was eliminated from any exposure after she became pregnant, say in two months, that would reduce its risk to the fetus to approximately 35 percent increased risk to that fetus. Now the question is if you face workers in a nuclear facility with a document in which all of these estimates, or someone else's estimates, which I don't think can be very different, you sign this document accepting this risk, how many workers would you get?

I don't know the answer to that question. But I have a strong feeling that one factor that emerges from this kind of analysis is that almost certainly females should be not exposed wherever possible, to any of this kinds of radiation exposure.

I would like to point out a few other things with regard to the source of radiation exposure under the occupational conditions.

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First, in looking for evidence of what the occupational exposures have been, as I mentioned, the reports I received did not give any of the film badge or other dosimetry data on the workers in the plant for Dresden reactor. But I was given the one from Humbolt Bay and it indicates at least a small percentage of the workers in the plant are receiving between 1 and 5 rem per year according to their measurements.

This kind of information, should certainly be available to the union, for example, the Atomic Workers Union. What are the experiences from the actual measured dose that these people are getting? Not some theoretical calculated thing, but what are they actually getting?

The second point to note is there is a linkage between the reactor operation and these industrial exposures. In that

if you have a very pronounced fail fuel rate, obviously you are going to get more crud in the reactor, more in the pipes, and you will have a higher radiation field in the vicinity of the parts of the plant in which you must operate.

So it is a question then of how well the reactors have operated. A final, rather minor point but perhaps not so minor, is that workers in nuclear facilities are going to get sick like everybody else and they will be exposed to medical x-rays or other medical use of radiation. A subcommittee of the National Academy of Sciences has looked at the [237]
question of whether you need to take any further action with regard to such workers who have received radiation exposure from other sources.

Now here I might point out to the Board you again by the linear dose response hypothesis, because on that model there is no, you simply add another radiation source. Since the risk in proportion to that part of it is an accepted risk for the benefit of the individual, then there is no real legal issue at point here.

But if you are representing a non-linear response curve, then you clearly have a problem. Now I would like to just briefly summarize a few remarks about the environmental release from normal plants operation of nuclear reactors. This subject was gone over in considerable detail in the as low as practicable hearings and for this reason I don't think we need to dwell on this at great length.

But I would like again to come back to the point that the question of the reactor experience is commonly expressed in terms of such things as percent of permissible release. For a long time, as nearly as I can say, this was the major way in which the AEC at least transmitted the release rates to the Joint Committee on Atomic Energy, for example,

and in other words, percent of what they were allowed to put out.

No discussion of what they were allowed to put out [238] was a good idea or not. In large part, no discussion of whether in fact anybody verified that this is what had actually been put out.

The history of the reactor program indicates that things haven't always gone so well. For example, I just received a report of release of radioactivity in effluents from nuclear power plants for 1971 and if you look at these, you see at least for some of the plants, the rates are going up rather rapidly.

For example, at the Connecticut Yankee — excuse me. That is the Ginna plant of course the noble gas went up substantially in 1971, such that it is putting out 31,800 curies of noble gas. Whether this is a significant environmental impact or not depends on the stack height, but by and large PWR's have ground level release.

The point I am trying to make here is that if you look at the operating history you can see that there is a general trend upward. Where is this going to level off? We can't say. The number of new fuel charges have been relatively low, they have been highly variable in their leak rates and many of them are approaching the one percent design limitation.

So that the point I am trying to make here is, one, you cannot go from this to an estimate of what the reactor will be putting out at any particular time, or for a year in which they have a much higher operating experience [239] than is shown for 1971, which for its BWR's is around 60 percent operating and for PWR's around 75, give or take a couple. Depending on which reactor you include, so the ideal of

course is to go from this to the environmental impact, if they were in fact operating at 90 percent capacity, which certainly the industry would like to do.

No where in these estimates are the potential health effects on populations within one mile, two miles, three miles, four miles, given. It would seem to me if we are concerned with the cost effects, environmental cost effects, there should be some efforts made. So with regard to fuel rates, fail fuel rates, I would say I have become somewhat more skeptical about the protestations of the industry that they will not operate plants at any fail fuel rates above say a tenth of a percent.

Another issue has to do with what happens with the plants we have now operating which cannot obviously meet the current as low as practicable standards. In the case of Dresden I, which is relatively small 200 megawatt leak capacity reactor, my estimates are that this, when operated at 90 percent capacity, will give a radiation dose approximately a mile or a mile and a half away in populated areas of about 75 millirems per year, clearly not meeting the as low as possible standards.

Now the question is what does AEC do about that?

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No action whatever is being taken to retrofit that reactor with longer noble gas hold-up times, while at the same time Dresden II and III are being retrofitted. My question is why not Dresden I?

I am asking this question in part because I am curious to know what the AEC feels is binding with these as low as practicable standards. Apparently they feel it only applies to new reactor design. But what about the people who are living there now?

Another question that is important, which I have found difficult to pin down has to do with the extent to which there are leaks, either into the secondary coolant, in the case of PWR's frequently, or in turbine seals in both types of reactors. These usually bypass the clean up systems or have to have special ones installed.

With regards to the boiling water reactors, I would only say that the dilution characteristics of the stack effluents are a matter of considerable debate. For example at midwest fuel reprocessing plants, which will have a hundred meter stack like the Dresden reactor, the Department of Commerce, or Department of Interior, I am sorry, or EPA — wait a minute — the Department of Commerce evaluation of the release of radioactivity indicated that their calculations of the dilution ratios were substantially different from the applicants, which had been accepted by the AEC.

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The AEC had accepted the applicants, by a factor of 3 not important of course if in fact the release will lead to small doses mabye, but it raises the question what about the dilution ratios for the Dresden plants, where it is important, where we already have this relatively high dose rate going out.

I had occasion last summer to be shown through the Dresden plant, Dresden I, II and III plants, and at that time the operators were proudly pointing out, it was a hot summer day, that all three plants were operating at 99 percent capacity. If I had asked the operators what is the radiation dose to the people in the environment, they would not have had the faintest idea. In fact I did ask them, there were discussions of how adequate their dosimetry was, and everybody agreed it was not very satisfactory.

The question for new plant siting is that the local meteorology is usually done very poorly and you cannot predict

from these general models of meteorologic dilution what the radiation dose is going to be from an isotope release from a stack. This is true of nuclear reactions and also fossil fuel power plants. Finally, as far as the boiling water reactors are concerned, the isotopic mix of both noble gas and, of both crypton and xenon noble gas varies considerably.

This has been demonstrated by measurements carried **[242]** out by the Public Health Service and also by the company itself.

The fact that the isotopic mix varies so much mentions that you cannot go from a total curie release to a radiation dose to the population with a one to one core density. This induces another source of error in the estimates of the dose. With respect to pressurized water reactors, I would like to not say a great deal about this, except that I mentioned the gaseous release at least from some of the operating plants seem to be a lot higher than had originally been expected, and thus constitute a monitoring problem for the agencies concerned.

Also the question of the tritium release rates is not really usually a problem if you have plenty of water for cooling, but if you have a limited water cooling system, like a cooling pond, you may have difficulty in getting an adequate diffusion to the as low as practicable release rates that have now been announced by the AEC.

I personally think that they are actually unnecessarily restrictive, as I have already indicated. So in conclusion, as far as my reaction to the impact of power plants on the environment around them, it seems likely that the technology is available to contain these materials in a way which will not produce any significant public health problem to the people living around it, but the question is **[243]** how

are we going to know it is effective? What kind of monitoring program is being carried out on a large scale, and what evidence do we have as to whether there are some unforeseen problems.

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I submit that the "as low as practicable" standards that the AEC has established will make it extremely difficult to know if anyone is meeting these standards or not.

Finally, I would like to say a few words about the problems of fuel reprocessing plants. Again my emphasis here is on what has been the experience, not what are we going to project into the future, what actually has happened rather than what do we hope is going to happen in the future.

The West Valley, New York plant is the only commercially operating reprocessing plant in the country and I think, as has been documented elsewhere, the releases of krypton have been about as expected, and the problem of krypton-85 doses from fuel reprocessing plants is essentially a skin dose problem. I will come back to that when we look at the other reprocessing plants.

Tritium, on the other hand, posed some different problems, and it is my understanding that the company itself, Nuclear Fuel Services, did not know how much tritium was going out in what form during a substantial part of the early experience of that plant. For one thing, the amount of tritium that remains in the cladding was underestimated so actually less was being released, but the question was how much was being released as hydrogen gas and how much as water, and that was not clear.

Surely before we embark on releases of tritium to **[245]** the environment — and there is currently no attempt being

made to contain tritium at the fuel reprocessing plants, the technology is very much more difficult for tritium than for all of the other isotops perhaps. So before we embark on releasing tritium, we need a good deal more information on how tritium moves in the biosphere once it is released.

In other words, is there any significant buildup in the soil, et cetera, around the fuel reprocessing plants as a result of rainout, incorporation into the water and so on?

It is my understanding that the Midwest Fuel Reprocessing Plant will release tritium only at specified times, because they will avoid circumstances where the tritium fallout will be maximized in the local area. This is a good step, a step in the right direction. But how do you enforce that? How do you assure it happens? You just simply leave it to the company to say, "We will release tritium when we feel it is appropriate."

Can you leave it to them?

Now the Midwest Fuel Reprocessing Plant is kind of the same size as the West Valley Plant, a one-ton-a-day plant, and I have had occasion to go through that plant, through the courtesy of General Electric Company, and it is an engineering marvel, there is no question about it.

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They propose to seal up the canyon in which all of the chemical processing will be done and from that instant on, no human touch will every be felt in that canyon. I respect the engineering expertise of the General Electric engineers, but this is a chemical engineering process the likes of which the world has never seen before.

So seal up an entire thing and continue it going for year after year, with only remote control services of the units, without any need to enter it, is a tremendous undertaking.

I take my hat off to them for even trying. But it apparently is necessary in order to be able to operate the plant.

Under those circumstances are we going to be able to guarantee that the containment ratios will exist all of the time, day in day out, as specified in their environmental impact statement? In particular, of course, one of the serious issues has to do with the actinide elements. These of course are in the form of plutonium, neptunium, curium and others will be present in relatively high curie activities. They will have to be contained since they are alpha emitters and these are among the most serious health problems if they emerge from the plant in particulate form.

Now it is not my contention that I can prove that they will not be, because I can't clearly. The experience in Savannah River and so on has been fairly good with the
[247]
containment procedures they have used. But how good, how long, et cetera, are things for the future? They will have to be contained extremely well in the plant.

When we move to the Barnwell Plant, we see another pattern which I would like to comment on. Midwest Fuel Reprocessing Plant is about a half mile away from the Dresden reactors so that the radioactivity that is being released from the reactors will be added to the radioactivity released from the Fuel Processing Plant.

Now in talking to the General Electric people it is my understanding that economically it really doesn't help them a great deal to be that close to these reactors, even if they do process the reactor fuel. Since they have to store it on site anyway for a long period of time before processing, they have to package it for transportation exactly the same way as they would if they were sending it across the country, the way the San Onofre fuel will have to be, and therefore the need to locate the plant next to the reactors is in no way clear to me, economically.

And what I submit has happened is that the choice was made as much because of convenience as anything else. That is, since the citizens in the vicinity of the reactors had already accepted the nuclear era, then give them some more because they don't really object to it much, and a little bit more won't hurt them.

[248]

Now I have tried to emphasize in the course of my presentation that a little more does hurt us, especially as you keep adding and adding. This idea of nuclear parks I think is a very serious mistake.

Now we have the Barnwell Plant, a five-ton-a-day plant, going up next to the Savannah River facilities, which have already extensively distributed radionuclides around the South Carolina countryside. My estimates of the skin dose from the krypton releases at Barnwell Plant are they will be in the order of 200 millirems per year, about a mile or mile and a half or at least beyond the border of the plants. I don't have a very clear estimate of the distances the prevailing winds, et cetera, and therefore this is not a firm number at this time, but it ought to be fairly close to this.

The difficulty with skin doses from radioactivity is that we have no really good estimate of risk. If you look in the BEIR Report, the question of skin cancer as induced by radioactivity is largely left unanswered. The reason is we simply have no data.

But it stands to reason that in accord with our understanding of our cancer inducing elements in the environment, that the presence of added ionizing radiation, in addition to ultraviolet radiation, which we already know is carcinogenic to the human skin, it would seem reasonable

to suspect there may well be a synergistic action between
[249]
ultraviolet and ionizing radiation.

So it may be that that 200 millirems per year, or whatever it ultimately proves to be, is not important, but it also may be important.

Note that my quarrel with the krypton releases is not on the global releases. I do think eventually the containment of krypton will have to be done, but I'm not concerned about the extent of contimination of the Northern Hemisphere atmosphere at this time. What I am concerned about is the people living downwind in the vicinity of both the Fuel Reprocessing Plant and the operating reactors.

Well, I will close my discussion at this point, since I think I have used up almost my allotted time, by simply pointing out throughout my discussion I have tried to emphasize that I can see at least three or four major areas of concern that have not been adequately addressed, and if they are adequately addressed in terms of the human health effects of nuclear power development, they definitely may change the economic picture, the plant siting picture, a number of these other pictures, operating expenses, et cetera.

If we translate all of these health concerns into economic trade-offs, that is building in better containment systems, cycling the workers in a different way, hiring more workers, if we can in other words solve them, in an economically viable way, then I would have no objection because you are
[250]
adding the true environmental costs of this type of industry where it should be added.

The question is will the industry have the foresight and determination to take those steps economically painful though they may be in order to provide an energy source in the future which will achieve its real goal.

Thank you.

CHAIRMAN PAGLIN: Thank you, Dr. Radford.

Questions from the Board members? Dr. Steindler?

DR. STEINDLER: You presented a lot of material which obviously I would have to digest. I have made a few notes and they may seem somewhat disjointed to you, for which I apologize. They are somewhat random and perhaps some are pretty trivial.

You raised a question about not knowing whether it is triated hydrogen coming out the NFS stack or triated water. I'm sure we are both aware that that question has been resolved, because analyses are available.

The major issue that I would ask you about is why is it important? There is, after all, a very rapid exchange of the hydrogen into water, even if it is being emitted as hydrogen and the quantity of hydrogen we are talking about doesn't present an explosive hazard I presume, so where is that important?

DR. RADFORD: It is not of very major importance,
[251]
Dr. Steindler. I only raised it because in some discussions some years ago with Mr. Runyon, who was at that time the director of the plant, I asked those questions and was not able to get answers.

The question of the rate at which the hydrogen would incorporate into other — exchange with other hydrogen sites might be some or there might be some differences. The diffusion rate of hydrogen is obviously different from water vapor, and it might depend on the relative humidity and so on.

I haven't worked out the kinetics of it and it may be a trivial issue.

DR. STEINDLER: I see.

You indicated there was a disagreement between the AEC and General Electric's stack dilution factor as calculated and the Department of Commerce I think it was as also calculated.

DR. RADFORD: Right.

DR. STEINDLER: Again I guess I have to ask a factor of three in an estimate of the stack dilution factors, using the windrose whose precision is poor, as you have indicated, why does that represent a significant point to you?

DR. RADFORD: Well, the significant point is that I think we all recognize that the dilution characteristics from the stack cannot be predicted better than a factor of [252] two, if that; in any rather special circumstances you can't detect it better than that.

The question I would ask is does this uncertainty ever appear in the final dose calculations? The answer is yes, always on the low side. In other words, the impression I have of the company's representatives is that they minimize the radiation dose by taking the maximum dilution characteristics. And when we have independent estimates of the dilution characteristics which would substantially increase the dose, these are I think quite significant.

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DR. STEINDLER: Do you think we have available or do you have available a comparison between the actual experience at NFS, thereby, so to speak experimental stack, versus the various calculations that were prepared for NFS prior to actual operation?

DR. RADFORD: No, I have no such experience.

DR. STEINDLER: I don't either. That seems to me that would be a pertinent experience factor to include in somebody's discussion.

DR. RADFORD: Well, it is true, it is worth pointing out, I didn't mention it, because Mr. Roisman had referred to, in the operation of the NFS, when it first went on line, they were not containing isotopes, the assumption being I-131 would have acknowledged to the point where it would be of negligible concern. It was found to be present, and I am not saying it was of major health significance, but the I-129 also went out and that is important. I have a statement from, in his case, EPA, which on page 146 of the environmental statement of the midwest fuel recovery plants it refers to the experience at NFS with regard to I-129.

I am not trying to make a case this is a major health hazard at this time, but with a 17 million half-life, this won't go away. In the case of the Middle West, specifically around the Chicago area, which is a goiter area, relatively low in cold iodine in the soil and in the bio, [254] therefore the addition of iodine 129 in significant amounts there would have a greater impact than in another part of the country which had a significantly high cold iodine level.

DR. STEINDLER: Are you suggesting, because you are citing that document, that the analysis of the iodine 129 problem that the staff has put in there is in error?

DR. RADFORD: The original containment, designed containment characteristics of the midwest fuel reprocessing plants were comment on by EPA and others and as a result they have changed the design characteristics.

Now all I am saying there is that isn't it a good thing that somebody besides AEC looked at it?

DR. STEINDLER: I think it is appropriate that I remain silent on that question. You indicated the potential of a synergistic effect between UV radiation and ionizing radiation. I think I have seen this comment before but I have not seen the slightest amount of evidence that there is such a thing.

Do you know of any evidence that would indicate that there is likely to be in fact a significant difference in the mechanism of action between UV and either high or low penetrating, energy penetrating radiation.

DR. RADFORD: There have been a substantial number of experiments carried out in cell cultures, things of this kind, of radiation effects, the UV and ionizing radiation. [255]
Whether it is any of these are germane to the issue of cancer, I am not in a position at this time to discuss, because it has been quite a while since I reviewed this literature.

However, it is generally recognized that if we follow the model of carcinogeneis that is current at this time, that it has something to do with a somatic mutation, then one can easily infer that the mutation induced by ultraviolate may be readily stressed by the fact that the ionizing radiation would interfere with the repair process. That is at least one defensible model.

Now, whether this has been looked at, experimentally, I just don't know. The problem I really raised was mainly that you cannot infer from Beir report, unfortunately, what the skin cancer problem is. It is one of the more common cancers, one of the least serious cancers, because it has a high cure rate, but nobody likes to get any kind of cancer. And in calculating the total cancer risk, it would be beneficial if we included the skin cancer component.

None of these risk estimates I have made have it, but we don't know what it is. We know UV will induce skin cancer. But I am trying to emphasize the fact that the statement is made that krypton 85 is not a problem, because it affects only the skin tissues and everybody knows they have a higher permissible concentration of radiation dose allowed. I am not sure that allowed rad dose is substantially enough [256] based at this time to permit us to know whether that is acceptable or not.

DR. STEINDLER: Thank you.

CHAIRMAN PAGLIN: Dr. Geyer?

DR. GEYER: Dr. Radford, this question is asked simply because I didn't understand what you said.

Is it your feeling that the assumptions with respect to stack dilution characteristics used by AEC are not conservative?

DR. RADFORD: Yes, I would say that is the case, in some instances. Actually it is my understanding that by and large they accept the applicant's stack dilution characteristics. Usually, it seems to me anyway.

DR. GEYER: Maybe I better ask this question of the Staff.

MR. SMILEY: We don't really accept anything in this regard. We do our own checking and calculations. Generally the applicants with whom we deal feel we are anything but liberal. I think they consider us rather conservative in this regard.

DR. GEYER: Thank you.

This next question I guess also has to be addressed to the Staff, but it involves a matter that Dr. Radford brought

up. The Hanford chemical processing plants, if they are still in operation, have been going for quite a long time.

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Could we be supplied with any information which shows the kinds of problems that occur in such plants?

MR. SMILEY: Are you referring to operating problems or are you talking about effluents or what?

DR. GEYER: These won't be the same exactly as the fuel reprocessing plants than being built for the commercial power industry, but they are not a lot different, I suppose.

MR. SMILEY: I must say I am not sure what is available in the open literature from the Hanford plants. I am sure environmental data from the outside is, but since they are Commission operated plants, I am not sure what is available on that.

Whatever can be supplied, we will give you, yes.

DR. GEYER: Since we have been talking about what experience shows, maybe we can find out here.

MR. SMILEY: I am not sure the experience would be comparable, but whatever is available, we can get it to you.

DR. GEYER: Thank you.

MR. SMILEY: One thing, Dr. Geyer, certainly all accidents are documented.

CHAIRMAN PAGLIN: Dr. Steindler?

DR. STEINDLER: One quick point here. You made the comment that I guess you were impressed by the GE plant and no one is going to enter the canyon and you raised the question about how, if nobody is there, we can insure [258] containment, I thought those were the words you used.

Are you suggesting that inability to have access to the processing canyon per se lends question as to whether or not they will be able to meet the DF across their sand filler, for example, which as you well know is in a completely separate building 100 or 150 feet away from it?

DR. RADFORD: I am not that much of an expert on fuel reprocessing technology. But I am aware of the general design of the plants since they were kind enough to show me through it.

I was thinking of such things as the extraction ratio of say the stages that are carried out in the canyon, such as neptunium separation or plutonium separation, whether these will be achievable under conditions, day in and day out, where they have perhaps a delay in the length of time it will take before they can detect and correct failure of some components in the whole system.

DR. STEINDLER: You are raising an operating question then?

DR. RADFORD: Right.

DR. STEINDLER: Let me try and find out how that operating question, which I suspect the operator of that plant would consider an economic problem, how that particular operating question relates to the safety of either the people in the plant or the public at the outside of the plant when [259] you consider that there are specifications that are set, for example, for the product.

DR. RADFORD: Well —

DR. STEINDLER: I am trying to translate your concern into the environmental concern, if possible.

DR. RADFORD: First with regard to the operators of the plants, themselves, quite clearly if you have loss of

highly radioactive material in the canyon, you can definitely build up radiation doses, they have a very thick containment wall, but it is not infinite. So conceivably you could get a build-up that would affect the radiation dose to the operators, at least in some sites, for example, where the remote units go throught the wall.

The second issue is really one of time scale. That is, granted that the product that comes out is specified in terms of let's say purity of plutonium or what-have-you, it is conceivable, it seems to me — I am raising it as a question I suppose — that over the short run, and by that I mean a week, there might be breakdowns in the system which would have the capability of permitting a very much more substantial release to the containment filtering system, et cetera, than would have otherwise been expected, and even theoretically, a criticality accident. So that is the kind of concern that I am raising here.

DR. STEINDLER: I would simply say I think you
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have addressed yourself in that particular instance to points which not only the regulatory people, but also the operator of the plant have had to cover in detail as part of their operating safety concerns, and while this is not the place perhaps to explore this particular point, the environmental impact of what you indicate, the various problems you pose, I think are not quite as clear perhaps as you might indicate them to be.

That is all.

CHAIRMAN PAGLIN: Those are all of the questions from the Board, Dr. Radford. It looks like you will make your appointment with something to spare. We thank you, Dr. Radford.

Mr. Roisman, do you have any further remarks from Dr. Radford?

MR. ROISMAN: No, but he will be here for the rest of the afternoon, so if something else comes up in the Board's mind, he will be available to answer them. If it should happen the Board has questions afterwards, we would be happy to have Dr. Radford address those in writing at a subsequent time.

As the Board knows, we will be submitting within the 30-day comment period written comments which will include the essence of what has been said here, and cover additional areas as well.

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CHAIRMAN PAGLIN: I want to address myself to that at the conclusion of the presentation of your group. I would think in consideration of our very efficient reporter — she has been here all day — we should take a break now but only for five minutes.

(Recess.)

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CHAIRMAN PAGLIN: May we come to order, please. Dr. Kendall.

MR. ROISMAN: Mr. Chairman, I was just going to announce that our last witness will be Dr. Henry W. Kendall who will discuss some of the areas —

CHAIRMAN PAGLIN: Excuse me. I beg your pardon. May I interrupt you, Mr. Roisman? Dr. Steindler has a quick question, one or two, for Dr. Radford.

DR. STEINDLER: I am sorry. I am concerned about the people who have to read this transcript. If I can ask the question this way — you indicated your four working

level months you calculate to be equivalent to, I thought you said, 20 rem per year. That differs from the National Academy report, and I am wondering whether that is based on your calculations or you have taken it out of here and I am misreading the report.

DR. RADFORD: You must be misreading the report, Dr. Steindler, because I wrote that section in the report.

DR. STEINDLER: I am perfectly willing to buy that.

DR. RADFORD: We used 5 rem per working level month, which did not significantly differ from the joint report issued by the National Institute of Occupational Safety and Health, and the National Institute of Environmental Health Sciences.

DR. STEINDLER: Were you suggesting — you made a comment that the contents of this report, the one I have [263]
reference to is entitled "The Effects on Population of Exposure to Low Levels of Ionizing Radiation," the same one you talked about. Were you suggesting by an omission of the contents of the approaches that are used in this report, omission by the Staff in the analysis, that this is a fault which they should correct? In other words, are you suggesting that this is the kind of document that should be applied as a basic standard when providing for an environmental analysis?

DR. RADFORD: Right. Absolutely.

DR. STEINDLER: Thank you.

CHAIRMAN PAGLIN: Fine. Thank you, Dr. Steindler.

All right, Mr. Roisman.

MR. ROISMAN: The more I think about it, I think Dr. Kendall is a man who needs no introduction. Most of the

people here have followed him in the emergency core cooling system hearings.

DR. KENDALL: My name is Henry W. Kendall. I am a nuclear high energy physicist, and a professor of physics at MIT.

Over the last now approaching two years I and associates in the Union of Concerned Scientists have been studying various aspects of the safety, safety assurances associated with the nuclear reactor program of the country. At the present time the Union of Concerned Scientists is in the midst of a study related to the subject of this hearing, [264] the nuclear fuel cycle.

I am going to speak today of three of the subjects of that study and there are others that I will discuss at the end of my testimony which will be included in the written presentation we make in a month.

What I wish to discuss bears very heavily on the potential environmental impact of nuclear reactors, and the associated apparatus for finding the fuel and disposing of the nuclear ashes.

These three subjects are: (1) the questions of catastrophic accident in nuclear reactor operation, its probability and its consequences, and a comparison with the assurances that have been made public by the reactor vendors, the AEC, and the utilities.

The second subject has to do with the diversion or possible diversion of what are called special nuclear materials. That is, uranium 235 or plutonium 239 from which nuclear weapons may be constructed.

The last subject has to do with the problems of the long-term storing of the very radioactive material as a

result of the fission of uranium in the power reactors under consideration.

Now in assessing the risk and the potential environmental impact of nuclear reactor operation, one has to do a number of things. One has to first assess the size and
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scale of the kinds of an accident that is considered credible. One has to establish, second, the probability for the initiating events of such an accident. And third, one has to estimate the probabilities that the systems that are designed to contain or mitigate such an accident will or will not work.

This kind of a program is what one has to go through in order to establish the assurances of reactor safety. The size and scale of an accident of major proportions associated with a nuclear reactor are a consequence of the prodigious quantities of radioactivity that accumulate in these from the fragments of uranium that are a consequence of the fission of the original nucleii of uranium 235. The quantities in equilibrium operation for a reactor are numbered in the many billions of curies. Indeed in numerical notation, upwards of 10 to the 10th curies or more.

This includes material of short half-lifes, intermediate half-lifes, and some alpha active elements referred to as the transuranics, which are not fission products, incidentally, which have half-lifes in the order, some of them, of tens of thousands of years.

This fission product accumulation is equivalent to the fallout from thousands of Hiroshima-size nuclear weapons, and substantial attention has been paid to preventing the inadvertent release.

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So what we are discussing is whether this substantial program is in fact adequate. 20 percent of these materials are gaseous in normal circumstances, and if the material is released to the environment, in one or another way, at least the gaseous material will be swept along by the wind and expose people outside of the site boundary to what can be lethal amounts of radioactivity.

If a proportion of the fission product contents of a reactor are released which are of the order of 10 or 20 percent, passage of the radioactive cloud can prove lethal at many dozens of miles from the reactor site under particularly unfortunate, but not uncommon meteorological circumstances. The distances may approach 100 miles. And human health and injury and increased susceptibility to a variety of diseases can occur at hundreds of miles.

The AEC prepared in 1957 an analysis of the kinds of accident that might occur from such a release for a reactor size which is small compared to the reactors now coming on line. This was referred to as WASH-704, and is well known to many of us.

In 1967, there was a request to Brookhaven that this be updated in the light of the larger reactors then being designed. This full update was not carried out on the basis, according to my understanding, that there was no substantive change in the radiological consequences to the [267]
core in the assumed range of meteorologies they considered, but there was only the update that was related to the increased size of the cores.

Our group has made its own update of WASH-704, with the results I have just briefly summarized. How does one prevent the release of this?

Uranium dioxide is clad in the zircaloy that forms the fuel roads. These in turn are mounted inside of the so-called pressure vessel which contains the hot water in one

reactor type, the steam for driving the turbines. This installation in turn is embedded in the containment, and perhaps in further buildings that are designed to form part of the defense system to prevent the release of activity.

However, the radioactive materials generate a great deal of heat, they cannot be turned off, and in the event of a pipe rupture or other kind of incident, it is possible that the cooling water would be lost.

If this cooling water is lost, and there is no emergency coolant restored to the reactor core, then a very rapid heat-up starts which after a period of a few minutes can no longer be cooled by emergency water.

The reactor core will proceed in unfortunate circumstances to melt down and the broaching of all manmade structures, and what appears to be the inevitable release of at least the gaseous components of the fission products.

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The nature of this accident is not known in complete detail, but there is little controversy that uncontrolled meltdown would result in very serious circumstances and would present an unparalleled hazard to people at some distance from the plant.

Now the AEC has selected the kind of accident that they will consider as the maximum credible accident, and it is a pipe rupture of one of the recirculating lines in the reactor, and it is referred to as the design basis accident. The probability of such a rupture forms one of the links in safety assurance. The probability of such a rupture is referred to as highly unlikely or extremely remote.

Nevertheless, according to AEC sources, it is considered likely enough so that emergency systems are provided to reflood a reactor core or provide spray cooling to it in the

event of a pipe rupture. Now we have to ask in viewing the chain of items that go to develop the assurance of reactor safety first what is the probability of having the kinds of rupture which could give rise to meltdown; and two, what is the possibility that the emergency systems will in fact fail to perform their function when they are called on.

There have been a variety of estimates and a variety of comments on the difficulty of estimating the occurrence of these pipe ruptures, but recently the AEC, in a document entitled "WASH-1250" has indicated that a major pipe

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rupture might occur as frequently as one in a thousand reactor years of operation.

This is not greatly dissimilar from a General Electric estimate applicable to their reactors. In the published estimations of probabilities in that document, the AEC further states that there is only one chance in a thousand that the emergency core cooling systems will in fact fail to function. The first important consequence from investigating this probability is that in our opinion it is not highly unlikely, in fact that is totally unacceptable. It is enormous.

This country has 150 reactors operating, under construction, or ordered. When these are all operating, we can expect on the basis of the AEC's stated probability to have one major pipe rupture approximately every seven years, and at the end of the century, when we have a thousand reactors, we will have one major pipe rupture every year.

This cannot by any measure be regarded as highly unlikely when looked at in terms of the entire inventory of reactors that is coming to be in this country.

Now the AEC, in considering that there is only one chance in a thousand, that given this accident, the emergency core cooling systems will fail to work, has not taken into account, in my opinion, the message inherent in the very lengthy transcript and document of records of the
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emergency core cooling hearings, which hearings very recently concluded.

In these hearings it was established that the majority of the nuclear reactor safety experts in the AEC's own contract safety laboratories, Aerojet Nuclear, Oak Ridge National Laboratory, and others, had substantial reservations about the assurances of proper operation of the emergency core cooling system.

In a letter from the Oak Ridge National Laboratory director of nuclear safety programs, William Cottrell, to the director of regulation on December 6, 1971, he stated for the experts in his group, "We are not certain that the interim criteria for emergency core cooling systems adopted by the AEC will, as stated in the Federal Register, provide reasonable assurance that such systems will be effective in the unlikely events of a loss-of-coolant accident."

D. L. Hobson and P. L. Rittenhouse wrote a letter to Horace Rosen of the Regulatory Staff on March 1, 1971, and stated, "We believe that there is a consensus that what might occur during a major loss-of-coolant accident is still open to question."

George Lawson, heat transfer expert from Oak Ridge, stated on March 1 of last year, "Any conclusions with respect to the effectiveness of emergency core cooling systems is speculative."

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Norman Lawben of the AEC Regulatory Staff in February 10 last year stated, "It is possible for certain accidents which now calculate a temperature of 2300 degrees F, that the cladding temperature calculation could reach melting."

Cottrell also stated in the Oak Ridge National Laboratory nuclear safety program annual information meeting, February 16, 1971, that in view of results that his laboratory had obtained in studying fuel rod swelling and damage which aggravated the course of an accident, that he believed it was doubtful the emergency core cooling could work.

Finally, Milton Shaw, in a letter to the general manager of the Atomic Energy Commission, G. M. Cavanaugh, in February, 1971, stated, "No assurance is yet available that emergency cooling can be delivered at the rates intended and in the time period prior to clad and subsequent fuel melting due to decay heat generation."

In view of these statements and of many more that are in the transcript of the emergency core cooling system hearing, it is apparent that the contention that the emergency core cooling system will work, 999 times out of 1,000, has no factual basis and in fact our own study has indicated that in fact the margins of safety that these systems provide have in some cases vanished entirely, and that there are certain accidents associated with pipe rupture for which these systems [272] will not work.

It is a reasonable conclusion from this analysis that within some number of years, which cannot be precisely specified, but which is very likely fairly short, that is of the order of 10, that there may well be a catastrophic release of radioactivity from an operating nuclear power reactor.

This is based on the Atomic Energy Commission stated probability of a pipe break. This probability neglects

other events which are not considered in forming the number. Pressure vessel rupture, which has not been shown to be impossible, operator error, and other presently undefined events. That could be heat cropping up — for those of you who are familiar with the field, I would mention fuel densification, the difficulties presented by certain small pipe ruptures, ruptures of steam pipes, and other things of this nature. So the likelihood of major release which I stated could very well be a substantial underestaimte of the rate at which these may occur.

The chance of the initiating events is totally unacceptable. There are a class of accidents for which the emergency core cooling systems as presently designed are in principle of no effect and are worthless. Pressure vessel rupture is one such.

It has been brought forward in the hearings [273] concerning the Maguire reactor by Professor Whitlaw that the bolts which hold down the main pressure vessel cover could in an unfortunate circumstance rupture, allowing the entire cover to be released and projected vertically upwards at some 200 miles an hour, carring away all manmade structures vertically, leaving the reactor internals open to the sky, and taking the control rods with it.

A preliminary estimate that he made of the probability of this was one in a thousand. There are apparently a number of reactors, Kewaunee, Prairie Island, possibly Surrey, for which the placement of the steam lines is unacceptable.

In the first two named reactors, the steam line passes underneath the auxiliary building, outside the principal reactor containments, and a rupture in that position would

disable all of the emergency equipment and leave the reactor with no residual core heat removal capability.

It also passes under the control room where a rupture would destroy the control room and kill the plant operators.

There are many unassessed effects or incompletely assessed effects that aggravate loss-of-coolant accidents. Radioactive heating has been underestimated. Secondary steam turbogenerator failure in reactors, which occurs normally in small amounts, has been shown to be able to defeat [274]
entirely the reflooding capability that is required to mitigate a loss-of-coolant accident in a pressurized water reactor. And flow blockage arising from fuel damage which was the phenomena that occasioned Mr. Cottrell's comment that he doubted if the emergency systems would work.

The links in the chain of assurances of reactor safety, in our opinion, based on a deep study of these matters and an involvement in the emergency core cooling system, the links are all defective, and the assurances of reactor safety are not what they are stated to be, but in fact are missing.

The consequence of this is there is a failure to provide protection in the event of a peacetime accident of unparalleled scale and consequences. The matters that I have discussed here, like the matters that Dr. Radford has discussed, in some measure have been disallowed in every hearing that I have heretofore been associated with. Taking in the aggregate these have to be considered in the environmental impact of nuclear reactors. The risk evaluations, the estimations of probability, the accident records, and the entire chain has to be made open for public review and scientific evaluation by groups such as our own, in order that errors of the kind that I have here identified shall be surely identified in all cases, and so that we will not

develop large numbers of reactors with the flaws that we now [275] see. The risk-benefit calculation which has been made somewhere has been a risk bestowed upon people other than those who made the decisions, particularly the general population, who have had the greatest difficulty in becoming informed on these matters.

The second subject I wish to discuss has to do with the materials, uranium 235 and plutonium 239, from which nuclear weapons may be fabricated. There are a variety of reasons why groups or nations might wish to acquire nuclear material, and many of these are familiar to use. Except for a large, well-equipped industrial nation, the chief obstacle to making a nuclear weapon is in obtaining the material.
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Uranium-235 is separated to the required concentration from naturally occurring uranium with only the greatest of difficulty, and plutonium is made artificially in nuclear reactors. In obtaining the material, then, diversion of someone else's supply can be a very attractive, inexpensive means, and in some circumstances it can be conducted in a clandestine way, and the ultimate possessor may not be identified.

Who would want this? There are nations who might, where even a modest nuclear capability, a handful of weapons and so forth, could set the stage for nuclear blackmail of non-nuclear powers.

It is impossible to assess precisely the security risk that this would present, and the risk to world peace. But it certainly is clear that it is a serious potential threat.

There are smaller groups than nations, but groups still with some kinds of resources behind them, perhaps major

resources, who might want this material. And in recent years it has become clear that such groups exist and could well wish to acquire it, groups such as Black September, possibly the Weathermen, and others.

This can be used for nuclear blackmail or possibly with the alpha emitters for a kind of radiological blackmail, which has not been well documented.
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The materials are, of course, also extremely valuable, and many experts have suggested that a black market worldwide could prove possible.

Ralph F. Lumb, who carried out an important study in 1966 for the Atomic Energy Commission on the subject of safeguards to plutonium and uranium-235 stated in AEC document WASH-1076:

> "It seems inevitable that a world market in special nuclear materials will develop, and with such a market we can expect developments of a black market and attempts for terrorist and insurrectionist groups to turn these materials for their own purposes."

And even more authoritative warning was imposed by AEC Commissioner Clarence Larson in the Los Alamos Safeguards Conference in 1969, who stated that:

> "Once special nuclear material is successfully stolen in small and possibly economically acceptable quantities, a supply stimulated market for such illicit materials is bound to develop, and such a market would surely be expected to grow once a source of supply has been identified. As the market grows the number and size of thefts can be expected to grow with it. And I fear such growth to be extremely rapid once it begins.

"Such a threat would quickly lead to serious [278] economic burdens to the industry and a threat to national security."

It needs no emphasis to add to those remarks that this is a critical and important problem. Unhappily the record of safeguards of these materials in our society has so far not been entirely satisfactory. There has been considerable effort and some resources devoted by the Atomic Energy Commission to the question particularly of safeguarding these materials while in the processing plants by methods of accountability, inventory, development of analytical and assay techniques and other things of this kind.

However, there has not been an equivalent emphasis on the weaknesses in the transport of these two hazardous elements. Special nuclear materials for military purposes are treated differently in transport from materials for peaceful purposes. And the guarding of shipments designed for peaceful purposes is much less stringent and much less well carried out than for the military case. Indeed, Brigadier General D. L. Crowson, who was head of the Atomic Energy Commission Office of Safeguards and Materials Management noted that the strategic nuclear materials destined for civilian purposes are usually shipped like a special delivery letter. And there have been a number of examples where quantities of material equivalents to a number of nuclear weapons have been inadvertently diverted in transit [279] and temporarily lost.

There have been other cases in which plutonium has apparently disappeared. In a recent article in SCIENCE it noted a 1969 SEFOR reactor which was deficient in a few kilograms of plutonium. And the Nuclear Materials Enrichment Corporation in person noted that over six years

the strategic materials had a 6 percent which was unaccounted for.

Now the impact of the fuel cycle must contain matter contingent on diversion of strategic materials, because the projected growth in the amounts of these in the society and the increasing ease with which these may be fabricated into nuclear weapons, as the technical problems and their solutions become more widely known, is generating an increasingly grave problem for us.

You will recall it only reqnires 5 kilograms of plutonium to insure a critical mass, and approximately 20 kilograms of uranium-235. And while there have been expressed problems with the possibly difficulties of fabricating weapons using plutonium produced in civilian reactors, which has a substantially larger amount of plutonium-240 in it than weapons-grade plutonium, it is by no means clear that the civilian reactor produced plutonium is ineffective in making a nuclear weapon.

The projections are that in the period toward the [280] end of this decade we will be accumulating plutonium in amounts typically 10 to 25 thousand kilograms per year, and a very small quantity of this diverted to the black market would be adequate to allow the kind of terrorist activities which we want no part of.

The aggravation of this situation when and if the breeder reactors are in wide deployment would be very greai, because the breeder uses weapons-grade material in large amounts, and this increases the amount in the system somewhere, and being transported.

The weaknesses in the transportation system have, like the consequences of diversion, been noted by a number of experts. In a paper presented at the International Confer-

ence of the Atomic Industrial Forum and the American Nuclear Society recently, November 1972, Mason Wilrich from the University of Pennsylvania stated:

> "The U.S. national safeguards system which should include effective measures for physical protection and recovery, as well as accountability, is still primitive. Under existing regulations, for example, it is possible that a large amount of special nuclear material may be stored in a locked building that is checked by an unarmed watchman only once every four hours.
>
> "In the shipment of a large amount of [281] special nuclear material by truck, the driver is not required to be accompanied by someone else, nor armed, nor even in continuous communication with any authority.
>
> "Moreover, there are no regulations in effect which specify procedures for the recovery of stolen material."

He goes on later in the paper to say:

> "Lacking an over-all rationale, the U.S. national safeguards system is embodied in a patchwork of AEC regulations and the ad hoc arrangements with particular licensees and contractors, lacking a single focus of responsibility with policy or control activities amied at preventing nuclear diversion. It is doubtful that the Commission can either develop or implement a systematic approach to the problem. The AEC cannot expect industry to cope effectively with its side of the nuclear material control problem unless it specifies clearcut objectives and detailed procedures and comprehensive regulations."

There is apparently no projected increase in the money that is slated to go into these activities in the AEC, inspite of the projected very great increase in the amount of materials which the system will have to deal with in the near [282] future.

We have, in the course of our study of this, and I should emphasize that it is still in course, verified the bulk of what Mr. Wilrich has stated. And it is our belief that the safeguards, particularly with transportation, but elsewhere, too, have not had the priority that they deserve. They are apparently not projected to have the funding and resources which we believe they deserve. And although there are now projected improvements in some of the transportation safeguards, it remains to be seen whether these will be put into effect so as to provide adequate security.

There are many other persons who evidently agree with our assessment of these weaknesses. The Deputy Director of the Office of Hazardous Materials of the Department of Transportation has stated he felt it was his duty — I will read the quote.

> "I feel it is my duty to alert you to the fact that the protection systems on which a great deal of reliance is apparently going to be placed by the AEC are not as reliable as you might think."

The Institute of Nuclear Materials Management, in May of 1970, stated that the situation with respect to transportation is "unpalatable."

These matters must not be deferred, they have to be dealth with with the kind and level of concern that is [283] commensurate with the possible hazard of a successful diversion.

In particular, we require a vastly improved physical security for all transport and storage, the kind and nature

of the shipments has to be viewed in light of possibly successful diversion attempts.

There has to be a substantial commitment to establish the risks and the probability of diversion and to select and to develop the kind of improvements that are required.

The last subject has to do with the long-term storage of the radioactive materials that are produced during normal nuclear power reactor operation.

In many of the publications that have outlined the nature of these problems, it has not been made clear that there are two components to the radioactive wastes. These have been mentioned earlier by Dr. Radford, and I would reiterate that there are fission products whose principal difficula components are cesium-137 and strontium-90, which have half-lives a bit shorter than thirty years, and which after a number of years' storage come to dominate the fission product material.

Storage of these materials alone requires times in the many hundreds of years, perhaps a thousand years or so, before they decay away to essentially innocuous levels.

[284]

Included in these wastes normally, however, are the so-called alpha emitters, also referred to as the transuranics, many of whose half-lives are in the tens of thousands of years, and plutonium with its 24,000-year half life is one particularly noxious example.

These materials have to be given storage of almost geological time spans, that is, hundreds of thousands of years. The quantities of these are lesser by some substantial amount than the fission products themselves. And so far the separation which would be desirable has not been proven to be technically possible. But it is a prospect on which

substantial importance in our opinion should be attached, because the short-lived materials can be put in different kinds of repositories than the longer alpha emitting materials.

The problem of storage and its effect on the environment has to be viewed in terms of the record to date to deal with this increasingly aggravated situation. Waste storage was accomplished in Idaho for some materials until the National Academy of Science, National Research Council report indicated the weaknesses that were inherent in that and the material had to be dug up and removed.

Lyon, Kansas has proven an embarrassment of substantial degree to the participants in it, where 100 million dollars was spent over fifteen years to develop salt bed **[285]** disposal of the materials, following which, in 1971, the AEC announced its request for $25 million to establish a National Radioactive Waste Depository.

A number of groups were highly critical of this, professional groups, and it was proved ultimately that the site was not, as had been claimed, adequate for the storage of these materials, but, in fact, was notably inadequate.

In the words of the Director of the Kansas Geological Survey, writing in *Technology Review* in March 1972:

> "In other words, the Lyons site is a bit like a piece of Swiss cheese, and the possibility for entrance and circulation of fluid is great. Other investigations revealed approximately 400 feet of displacement in arbuckle rocks, suggesting the presence of a major fault."

All of these facts have led the Kansas Geological Survey to recommend that the Lyons site be abandoned.

[286]

An independent analysis by a committee of the Kansas Geological Society produced similar conclusions, as did the analysis of the Council of the Kansas Academy of Science. He went on to comment on the whole general concept, and stated:

> "As to the general concept of burial of nuclear wastes in salt, the jury is still out. Appropriate studies should reveal whether or not radiographic wastes can be stored safely in salt."

So that we are still left, as has been stated earlier here in testimony, with accumulating amounts of this and nothing but temporary storage. Is the temporary storage adequate? It cannot at this time in my opinion be so stated with adequate assurance. And there seems to be some difficulty among the experts as to how good and for how long the temporary storage which is not yet fully designed will in fact work.

Mr. Pitman, Mr. Frank K. Pitman, Director of the Division of the AEC Waste Management and Transportation, in a paper at MIT last July stated:

> "It is expected that even with nominal maintenance, the structures could be maintained in serviceable condition for many hundreds of years."

I believe that he made an equivalent statement today in reference to temporary storage structures.

The Assistant General Manager for Environment and
[287]
Safety of the AEC, in the journal "Nuclear Industry" last December stated a somewhat different conclusion:

> "Use of man-made engineered storage assures that there is a safe solution to the high level waste problem for many tens of years and possibly several centuries."

So we cannot be completely sure in fact that these things will be good for many hundreds of years or that one will not be faced sooner than one thinks with the juggling of these materials. In our opinion the question has never been adequately explored of the legacy that we are developing for future generations for tens or perhaps hundreds of thousands of years of material to be handed down to our progeny.

And that deserves a much more thoughtful and careful look than it has so far gotten. In doing this, it seems to us appropriate to solve the disposal and/or storage problem as it exists and not take advantage of temporary, possibly inadequate techniques, and hand this off to someone else. It is a new kind of risk-benefit calculation which allows us to gain the benefits now and hand the risks to people who are yet unborn, to hand the storage problem to a society which may or may not be able to continue to assure the safety of materials from which they will gain no benefit whatever.

In concluding this report, delivered in the midst of our study, pursuant to the subject of this hearing, I would [288] just like to emphasize again that on all questions of environmental impact, of man's options, and in particular options that are associated with radioactivity and nuclear fission, one has to inspect the prospects in the view of recent history and recent experience, which unfortunately has not always been as satisfactory as many of us would have liked to hve seen.

The question really is should one lay out the plans and carry out the projects on the basis of things as they would hopefully be, or as they are likely to be? And there is a very substantial divergence between these two concepts and

one cannot look at the program, in my opinion, through rosey glasses following a thorough inspection of what has passed recently.

Thank you.

CHAIRMAN PAGLIN: Thank you, Dr. Kendall.

Questioning by the Board.

Dr. Steindler?

DR. STEINDLER: Dr. Kendall, could you describe in a very few words how you view the relationship between the review of the ECCS and the reactor accident in relation to the documents we have on the fuel cycle, which excludes completely the reactor *per se*?

DR. KENDALL: It is our opinion that it is a most important matter in looking at the environmental impact of the [289] fuel cycle to look at the whole fuel cycle. And I'm in the position of Dr. Radford of having tried to raise some of the issues I have described today in the individual plant circumstances and in the energency core cooling system hearings and I have been unsuccessful.

There is nothing that is more useful to groups like ours and I believe both to the AEC and to the reactor industry than to see these matters all laid out together in a coherent form and with a careful synoptic view. And we are taking that position in the preparation of our written material and I have taken that view today because the reactor program cannot be investigated through a microscope, one piece at a time, because the impact of the one-thousandth plant can be little more than one-tenth of one percent of the impact of the program.

And investigating the chance of an accident will show very easily that what might be an acceptable probability

for a single reactor can very well not be acceptable when you have a hundred or when you have a thousand and I feel that it has been a defect in the particular environmental statement that we are discussing today that the entire fuel cycle has in fact not been studied in this way.

Mr. Roisman would like to add I think to that.

MR. ROISMAN: Doctor, I guess in a sense it is basically a legal question as well. It is our judgment and you [290]
may notice that other participants here have suggested in written comments their feeling that there should be a generic approach to problems which are generic, site related problems of nuclear power plants are properly handled at the site, but the question that we see as being involved in the environmental fuel cycle is let's remove from those individual licensing proceedings the duplication that would occur, those environmental impacts which are generic and treat them as a single document.

As you know we suggest that that document must be prepared in the context of an ajudicatory, generic hearing, but you would then have an important part of the cost-benefit analysis that has to be done in deciding whether or not to license a particular power plant. You would have some feel for all of the generic questions.

We have been foreclosed time and time again to talk about questions like risk probability and the consequences of reactor pressure vessel rupture, the likelihood of that event, or hamstrung by narrow interpretations of our rights.

This document should be, could have been but is not, a document that deals with that. The thrust of much of our presentation today is to suggest what we think the proper

scope, as well as the proper procedures should be in connection with this. So it is in our opinion a flaw in the document.
[291]

Obviously there is nothing relating to these subjects in it, in fact accident analysis at almost any phase of the fuel cycle is treated cavalierly, to say the least, in our opinion. And much of what Dr. Kendall has said about the emergency core cooling system experience we think is teaching for the question of whether or not accident analyses that appear in this document and relate to other parts of the fuel cycle shouldn't also be substantially more thoroughly investigated.

There is a long-term lease on in the ECCS experience and that is that an agency that has as much invested in nuclear power promotion is unwilling to talk about the bad side of the story.

Now an environmental impact statement of course, an environmental report, would have to include that. Part of our presentation is to attempt to open up the questions, not answer them all.

DR. STEINDLER: Fine, I would have hoped that in light of your approach to the question of accident analysis you could have addressed yourself either now or subsequently in great detail to the shortcomings of the accident analysis as you read it in that document. I am assuming that on the basis of your interest in those analyses, you will do so at some time in the future.

Let me ask a few other questions of Dr. Kendall.
[292]

Are you suggesting that because weapons have been made out of 93 percent enriched U-235 that the three to

five percent 235 fuel material that is used in reactors represents a weapons risk?

DR. KENDALL: It perhaps represents a tiny risk.
[293]

I was not suggesting that it represents a risk as important as the transport of weapons-grade 90 percent enriched, which I would note is used in high temperature gas cooled reactors of which there have been six or eight already sold, with one coming on stream imminently.

How a reactor of that kind, which may figure prominently in the National Power Reactor Program, and which topic was not discussed in the Environmental Survey of the Nuclear Fuel Cycle, a reactor of that kind contains two tons of weapons-grade uranium-235. So to that extent it could figure in an important way in diversions.

DR. STEINDLER: So your comment on uranium was a generic comment in a sense, then?

DR. KENDALL: I believe so. I believe in that sense it was.

But I was particularly referring to shipments of the weapons-grade and, of course, plutonium.

DR. STEINDLER: The shipments of plutonium that you referred to I presume are not the once that are currently going on, since I gather trom the discussion I think this morning or earlier this afternoon, that plutonium as such is currently being stored.

To what extent do you, then, consider shipment of plutonium as a risk item?

DR. KENDALL: I wasn't in the audience during the
[294]
time of the earlier discussions, so I can't base my answer on knowledge of that.

But there is now application to use plutonium in operating reactors in the country, in particular Vermont Yankee, which is to use plutonium rods. So that this becomes now part of the normal transportation of fuel.

DR. STEINDLER: So that also, of course, I think you know, is excluded by specific design from the uranium fuel cycle we are talking about.

I am trying to focus in on the pertinence of what you have said to us, and which obviously the Commission is going to read, since that is the funciton of this whole thing, in relation to our documents here.

DR. KENDALL: The title of the document is "Environmental Survey of the Nuclear Fuel Cycle," and the use of plutonium certainly is encompassed in that subject and title.

And the plutonium, of course, is developed, is made in reactors, which are fueled with uranium, and it is a part of the material which is separated out in the fuel reprocessing plants.

MR. ROISMAN: Excuse me; but with regard to that last question, I think we should make it clear it is not our intent to be bound by the Commission's attempt to unnecessarily narrow its view of what the environmental effects of
[295]
the nuclear fuel cycle are.

CHAIRMAN PAGLIN: You say, Mr. Roisman, you are not going to be bound by the Notice of Rule Making?

MR. ROISMAN: No. I am not going to be bound by what the Regulatory Staff put in the yellow documents. The Notice of Hearing said we were going to be discussing the wisdom of taking several different legal courses of acton. We suggest that thw wisdom of that action is suspect

because it is based upon a document which doesn't talk about many of the most important problem.

But it should not be surprising that we are in great conflict with the Staff on this. You have heard what we have to say today, you have heard what they have to say. We think they are talking about the wrong problems in many cases.

Obviously the thrust of our presentation is, Let's start talking about what people ought to be concerned with.

We are bothered by the Commission's unwillingness to talk about anything other than the so-called good news, without talking about the waste.

We hope when the Commission reviews our fuel cycle report and our statements on the record today they will think again about whether they should accept the Staff's very narrow concept — I think, Doctor, you pointed out the title of the document is deceptive, they say in the beginning, We [296] are excluding this or that. And we are saying that's wrong. You should not have excluded those things.

DR. STEINDLER: To get back to a technical subject where I feel more at home: Dr. Kendall, are you suggesting by your discussion on the problems with long term disposal of waste that the environmental impact of wastes as being part of the fuel cycle should not be considered until a solution is available to their ultimate disposal which is sufficient for all time?

DR. KENDALL: I have a little trouble hearing. I am going to get the question from Mr. Roisman.

CHAIRMAN PAGLIN: Be sure you get it the same way.

MR. ROISMAN: To avoid any Russian gossip problem, Mr. Chairman —

CHAIRMAN PAGLIN: I was just twitting Mr. Roisman.

MR. ROISMAN: I knew you were twitting Mr. Roisman.

Doctor, if you wouldn't mind repeating the question a little more loudly. Dr. Kendall does have a hearing problem. And your microphone is on, but it is fairly far away.

[297]

DR. STEINDLER: Let me try once more. Perhaps to simplify the thing, what I thought I heard you say was that there really isn't any point in considering the disposal of wastes as part of the environmental impact until you have a procedure available to you that will solve the problem of ultimate disposal for all times. Is that what you meant or am I interpreting something wrong?

DR. KENDALL: It is not what I meant, Dr. Steindler. I think it is critically important to survey all of the ramifications. The AEC has decided recently, indeed, it has backtracked recently to focusing on temporary storage and its environmental impact should include a detailed and deep review of the implications of this backtracking, because the temporary storage was initially rejected as a consequence of the required surveillance of the material. What we are asking for in this and other areas, are complete and in-depth reviews of all of the alternatives, including the commitments to search for adequate really long-time disposal methods which would not present a hazard either at the present time or over the entire life of these noxious materials.

DR. STEINDLER: You don't consider it as an acceptable practice to store high level wastes under surveillance for a prolonged period. Is that correct?

DR. KENDALL: There is a tendency which has been noted in reports that the backtracking to temporary storage, which [298] in my mind is not really acceptable and would not be if we had an adequate permanent disposal for the material, is not wholly safe in my opinion. These materials have the potential for widespread contamination, and major portions of the oceans or land mass could be contaminated in an inadvertent release, and the temporary storage to my mind, is really not safe.

And when the AEC believed that it could successfully store in Lyons, Kansas, it abandoned temporary storage because of the surveillance required. There should be a heavy commitment to finding a place for this, and if no place can be found for it, then the program that generates it should be reevaluated, in my opinion, and the material has to be thought out, perhaps through the route of detailed examination, in connection with the environmental impact study of the waste material itself.

DR. STEINDLER: One more question, I don't want to belabor the problem of wastes, but do you, if given the question of choice, would you prefer "permanent disposal" with some unknown far into the future risk, versus, what you call temporary storage with a string attached to the wastes in a recoverable form with the appropriate kinds of assurances you heard given this morning — you weren't here — that you would have heard if you had been here, which doesn't help much.

[299]

DR. KENDALL: In my opinion, there is not at the present time enough information available either to me or to the people who have presently these problems and have responsibility for these problems, to decide that matter adequately. I think it requires a further commitment to

research and study before that can be adequately answered. We do not know whether there are places deep in the earth where this material can be placed where it could be assured at some level of adequacy that it would never again interfere with human activities.

If someone could demonstrate to me that, for example, you could store it at the bottom of a 10-mile deep hole and close the channel and that the materials had no appreciable chance over the times required of returning to the surface, then I would prefer that.

DR. STEINDLER: So would I. I think so would everyone. I guess what I am asking is, short of those assurances which I think we both appreciate are somewhat hard to come by, you still do not choose what you call temporary storage of the kind I hear the Commission moving to.

DR. KENDALL: There seems to be no alternative at present to temporary storage, because the issues have not been resolved. There has not been an adequate and diligent search to establish whether the 10-mile hole, for example, is feasible. Dr. Schlesinger announced sometime ago that they **[300]** were studying the possibility of rocketing the wastes into the sun. Whether or not this is a visionary scheme, it is surely agreed by everyone, I think, that it is not presently practical. And a scheme like that, if it worked, would be fine and I can't give you an informed and thoughtful opinion in the absence of adequate body of technical information.

It is desirable to have happen just what you stated, namely, to have the materials permanently out of sight and with no possibility of their return. And what is required is a diligent application to search for these technical solutions.

I think if these solutions are not forthcoming, then the program should be reevaluated, that is, giving rise to the radioactive wastes, namely, the nuclear reactor program. You can't operate if you don't know what you are doing and that is not the situation at present. I am uneasy with the above-ground storage for the same reasons AEC was originally uneasy with it. And they are stuck with it, because Lyons, Kansas, was a major fiasco, frankly, and they were forced back to it.

Now what will become of this, I don't know. But it needs further study.

CHAIRMAN PAGLIN: I have just one question, not on a technical basis, I can assure you, but I want to have specific references to Dr. Kendall's remarks, with regard to **[301]**
nuclear blackmail and the potential terrorist activities. What I am a little puzzled about is its relevance in terms of the subject of this particular rule making, however, you may not wish to have it so restricted. The subject of this rule making, as I read the notice, has to do with the enviornmental effects of the particular licensing having to do with the economic, technical or other effects as against the benefits of the facility. I say this with all due respect, Dr. Kendall; I guess those words are exciting reading in newspapers, but I would like to have your statement, when you finally file it, indicate the relevance between the responsibilities of the Atomic Energy Commission under the National Environmental Protection Act in these respects as against, at least, what I read to be the subject matter of your comments in this particular wise, and that is the military and potential security aspects of the transportation of nuclear materials.

Do I make myself clear?

MR. ROISMAN: Yes, Mr. Chairman. Again, let me emphasize that our purpose, the objective of both organizations, is a thorough analysis of what is involved when the country continues to develop fission nuclear power so a judgment can be made.

Now, we see this as an opportunity to have that discussion. I don't think there is much doubt, however, that **[302]** the National Environmental Policy Act is the act under which it would be perfectly permissible to demand a review of the questions of terrorist diversion. That is an activity which is classifiable, if you will, in the same as an accident or quality assurance, both of which are subjects in individual licensing proceedings, when we talk about the accident happening or a poor quality assurance program.

The act itself is based on the premise that we will try to find what are the possible environmental impacts, and those impacts have included not merely the simplistic questions that we initially thought about in terms of the environment, that is, how many fish will get hurt, but what is the effect going to be.

If the shipment of weapons grade material is tied into the nuclear fuel cycle, in the development of nuclear power plants, if that shipment is subject to diversion and we can see a rational chain of events — I think Dr. Kendall more than adequately substantiated that rational chain — then we have to ask the question, given what our present methods are for controlling that diversion, what kinds of risks are we dealing with.

I mean the reason pipes break in plants are to some extent because of quality assurance, somebody screwed up somewhere and the pipe got weak at the wrong place and wrong time and there was a break. Now, we are talking

about a break **[303]** of a different kind, a break in the chain of shipment or storage of weapons grade material and that, too, has a consequence that is predictable, that is it will get into the hands of somebody who shouldn't have it, then will use it in an irresponsible way.

While it may be difficult to scope that impact, you can imagine several different scenarios, it doesn't back away from the impossible, it only says do what you can, do the fullest extent possible, as the language in Section 102 states.

CHAIRMAN PAGLIN: You see then, forgive me for using the word, a fusion somehow between what is known as, I understand, the impact on the environment as against the political and military security?

MR. ROISMAN: Of course, what is precisely involved in political and military security is that someone threatens to do a heck of a lot of damage to the environment in exchange for something they want. And that is a pretty high risk, depending upon who you think is going to make the decision and how stable you think the people who have their hands on the thing.

CHAIRMAN PAGLIN: That clarifies it in a more generalized sense than did Dr. Kendall.

MR. ROISMAN: Dr. Kendal may want to say something with regard to this also.

[304]

CHAIRMAN PAGLIN: You understand reasonable men may differ on that interpretation, nevertheless.

MR. ROISMAN: I am perfectly well-aware of that. I think reasonable men may have an opportunity to differ in the not too distant futnre in a forum where we will all know who is right.

DR. KENDALL: I would add to that, if the whole question of diversion and terrorism were restricted wholly to blackmail which was successful, then there would perhaps be a very low probability of their being environmental effects. But much of what we consider now in regard to terrorism has to do with outright acts of violence, and we consider it possible, perhaps likely, but possible, that the diversion of nuclear material, would, in fact, lead to a radiological event of some kind, using the materials as radiological weapons, a matter which has not been much explored, or actually constructuring and detonating a nuclear weapon.

To this extent, of course, the impact on the environment can be very substantial.

MR. ROISMAN: Mr. Chairman, my colleague has also brought to my attention a case on the subject which may be instructive. I see it is contained on page 6 of the documents submitted by Babcock and Wilcox. And the case is Handley vs. Mitchell, which involved the question of the environmental [305] impact associated with, among other things, the construction of a jail in a particular community. And the court rules there that the possibility of a riot at the jail would have an impact on the communities in which the jail was associated and that, therefore, was an appropriate matter to be considered under the National Environmental Policy Act in judging whether to put the jail at that particular location. I think that is fairly close to Dr. Kendall's comments with regard to terrorist activity in general.

CHAIRMAN PAGLIN: I won't pursue it at this stage; I think it should be handled in the written documents. I have been advised that the Regulatory Staff has some timing problems with respect to their transportation. Were you going to say something about that, Mr. Murray?

[306]

MR. MURRAY: Well, Mr. Chairman, I would sure like to say something. But decorum prevents me from pursuing it.

CHAIRMAN PAGLIN: You will have your opportunity, Mr. Murray. I am talking about the time. I see the hour is almost a quarter after 5, we have had a long day. I expect that Mr. Roisman will be here tomorrow morning because I have some questions I want to address to him. Then perhaps you will have an opportunity.

MR. ROISMAN: Yes, I will be here.

Do I understand that Mr. Kendall and Dr. Radford can be excused.

CHAIRMAN PAGLIN: Is that correct, the Board members have no further questions of Drs. Kendall and Radford?

(No response.)

CHAIRMAN PAGLIN: They may be excused.

We will resume at 9 a.m. tomorrow.

(Whereupon, at 5:10 p.m., the hearing was adjourned, to reconvene at 9 a.m., Friday, 2 February 1973.)

[307]

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF:
URANIUM FUEL CYCLE

Docket No. RM-50-3

New Executive Office Building
Room G2008
17th & H Streets
Washington, D.C.
Friday, 2 February 1973

The above-entitled matter came on for hearing pursuant to notice, at 10 a.m.

BEFORE:
M. D. PAGLIN, Esq., Chairman
DR. JOHN C. GEYER, Member.
DR. M. J. STEINDLER, Member.

APPEARANCES:
(As heretofore noted.)

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PROCEEDINGS

CHAIRMAN PAGLIN: Good morning, ladies and gentlemen. We are resuming the nuclear fuel cycle hearing this morning. The dedication of the people who came here to this hearing in view of this rainfall is without measure.

This morning we would like to have some questioning by the Board members of Mr. Smiley first, and then we would like to put some questions to Mr. Roisman, and thereafter,

according to our schedule for today, we will then proceed to the presentation by the Atomic Industrial Forum, and that will be followed by Mr. Freeman's presentation on behalf of Baltimore Gas & Electric, and the other utility companies appearing jointly, to be followed by the New York State Atomic Energy Council, and then Mr. Dzugan of the Minnesota Pollution Control Agency. Those are the schedule of appearances for today.

All right. Now, Dr. Steindler, do you have some questions of Mr. Smiley?

DR. STEINDLER: Yes, I do.

There was a comment made yesterday that a portion of the fuel cycle is outside of the area of licensing authority of the Commission, and I think you referred to compliance and the U.S. Bureau of Mines apparently is the group that has charge of that area. Can you comment on whether or not — or can you comment on the quality of the [309] standards used by the Bureau of Mines in their assessment of both worker safety as well as environmental impact? The quality of the standards as it relates to the kind of standards that you use in those areas in which the Commission has licensing authority.

MR. SMILEY: Well, I am not sure how to answer your question. We, of course, have very strict standards for people who work in the fuel cycle plants we have control over. And that is for every part of the fuel cycle. We do not have jurisdiction, as we indicated, over the workers in the mines. And I guess I am really not prepared to comment on the levels that they use for the workers in the mines.

DR. STEINDLER: All right —

MR. SMILEY: Also these are state functions, too, just as a lot of other operations which are under the Bureau of

Mines, for other types of mining operations are state functions. In other words, it is not an uncommon thing for the states to have this kind of responsibility.

DR. STEINDLER: Is it then reasonable to assume that portions of the fuel cycle being under the jurisdiction of various agencies, not only various departments within the federal government, but also the various states, could encounter a variety of standards both in terms of subject matter as well as quality?

MR. SMILEY: No, I would not go that far. The **[310]** mines, I think we would have to say there are standards, I believe, set up by the Department of Labor and the Bureau of Mines. I would like to make one other comment on the rest of the fuel cycle, which you addressed yourself to, and then ask Mr. Nussbaumer to comment on the other question you asked.

The only other operations that we do not control are the gaseous diffusion plant, where there are standards set up. And the mills that are in agreement states. Now we do have a program with the agreement states where by statute we make a finding that the agreement states have programs that are adequate to protect the public health and safety. And also compatible with our own. We make these findings every year. So I think it is too broad to say that we do not have some control over these activities. We work very closely with the states.

As I indicated yesterday, there is a group called the Radiation Program Control Directors, it is actually a national organization, or at least involves the program directors from all of the states, and they meet on specific problems involving radiological health, not only with respect to the fuel cycle, but other activities, such as x-rays, for ex-

ample. And they are looking very closely at the points that you mentioned.

Just as a case in point, there was a meeting held — **[311]**
excuse me just a minute, Dr. Steindler.

There was a meeting held back, I think, in February of 1972. This was a seventh session, they called it a federal-state enforcement conference. And a board of conferees, which included representatives from New Mexico, Utah, and Wyoming unanimously endorsed the adoption of model regulations which would require stabilization and long-term care of uranium mill tailings. Approximately 88 percent of all of the U_3O_8 reserves in this country are from those states. So to that extent, there is control quite comparable to our own.

Now there is the question you raise of the miners. Perhaps Mr. Nussbaumer would like to make a few comments on that.

MR. NUSSBAUMER: I think it is important to note in that regard that on the standards for uranium miner exposure that there has been input from not only other federal agencies, but many of the scientific experts in the country, and a couple of years ago the Joint Committee on Atomic Energy held hearings on the proposed standards of the Department of Labor, and received testimony from medical and health physics authorities on the adequacy of the kinds of standards that should be used for this purpose.

So the point here is that although the Department of Labor and Bureau of Mines have responsibility, they do **[312]**
receive input from other agencies who have competence and from other individuals who have competence in this area.

DR. STEINDLER: Thank you.

I have another question. There has been some discussion, perhaps not totally adequate to provide a meaningful record for the Commission, on the whole question of global krypton-85 and tritium, the impact of the fuel cycle on the total amounts on citizens. Since there has been some comment that the document itself is perhaps not as explicit in this area as it might be, would it be possible for you to comment on both what has been said and the general attitude of the Staff?

MR. SMILEY: Yes. It has been stated that krypton and tritium do enter the earth's atmosphere and this is quite true and for this reason we are very conscious of the problem, and it is a question we address ourselves to specifically and in great detail in the review of fuel reprocessing plants.

I think it was stated yesterday that the tritium balance, for example, was such that there might be a difference of factors of two or three in how well people knew tritium. I think that is probably true.

I think what should have been said also, though, there was mention of hydrating or trititing of the zirconium and I think what should have been said is that any attempt at the balance, for example, at the NSF plants, has always
[313]
come up with tritium values that are very low, like 20 to 30 percent of the actual value.

I think it is fair to say these are noncharacteristic fuels, as far as the LWR is concerned. They are special fuels. I am not trying to say only 20 or 30 percent of the tritium that most people say will arrive at the reprocessing plants or reach the atmosphere actually is the figure. It could be

substantially higher than that. But technology does tell us in terms of tritium that chances are it will be lower than what you calculate, because of the hydrating effect of zirconium.

From what I recall of personal experience, I think the pressure and the temperature of operation of the reactors is such that you do favor this trititing effect. So I would expect not to see, I would expect to see less than we actually report.

In terms of our calculations, taking tritium first, we do assume that all of the tritium that is generated by calculation enters, or becomes an effluent. In the cases of the Barnwell plant and the Midwest Fuels Reprocessing Plant, that tritium will be put out the stack, at a controlled rate, pretty much at the rate that the stuff is produced.

In terms of NFS, it goes two places, part up the stack and part of it goes into Buttermilk Creek. That ratio is fairly well known, too, incidentally.
[314]

I think that question came up, and I think you actually answered the question yourself, as I recall.

Now the amount of tritium we are talking about in terms of whole body dose, which is the way the item of most concern is, is very small. And from our own calculations, we have concluded that at the Barnwell Plant, which incidentally will handle 50 annual reloads, 50 annual reloads, the whole body dose from tritium will be a little over 1 millirem annually. That is from the whole plant. That is for all 50.

And to put that in perspective, I recently had occasion to go to California and I believe it got something like eight or 10 times that on my trip to and from California by flying at about 30,000 or 35,000 feet. So that is the amount of,

that is the radiation level or the dose at the perimeter. This is at the site perimeter of Barnwell for tritium.

[315]

DR. STEINDLER: Is that because of the vapor expulsion of tritium through the stack?

MR. SMILEY: Yes, it is vapor expulsion and proper dispersion factors are used in the calculations. Now, tritium can be expected, as I explained yesterday, to enter the water strictly by condensation or other mechanisms of exchange.

So essentially, the tritium ends up reasonably close to the site, like in the 50-mile radius we use in the demography study.

So that is not the kind of thing you see in terms of getting spread all over the universe, as you would see with the krypton, which I will comment on in a moment.

So the amount of tritium is small.

I would like to make this point. I would also like to make the point, since it was brought up, that it has been small at NFS, as have all other effluents from NSF relative to standards. They have never exceeded the standards that were set. We can comment on that if you care to go into the question.

The krypton is another question. Here again, however, calculations will show that at a plant the size of Barnwell, the amount of radiation from krypton is extremely small. Again, we are taking care of 50,000 megawatts electricity a year at this one plant, the discharge of fuel of **[316]** that amount.

One of the reasons it is small for the whole body is the fact that krypton is mainly a beta emitter, so it is mainly skin dose that you get. It makes a very small contribution

to the whole body. It contributes about one-fifth of the total exposure of whole body. So when I said a little over millirem, that was tritium and krypton at the site.

As to the skin dose, our calculations show — I think I heard a number of 200 millirem to the skin at the MFRP, Midwest Fuels Reprocessing Plant. That is not the number we come up with. We came up with a number at MFRP of 4 millirem to the skin, about 13 at Barnwell.

Of course, our calculations, we would be pleased for anyone to review these calculations. We have not only looked at the data that has been presented to us, but made independent calculations of this. I think these numbers check pretty closely with the other numbers I have seen, like the study of the year 2000.

So we are talking about roughly 4 millirem at MFRP, and about 13 millirem to the skin at a plant like Barnwell, that handles 1500 tons of fuel a year.

In terms of whole body dose, there are some interesting observations. First of all, by the year 2000, a lot of people talk about the year 2000, only 30 percent of **[317]** the total amount of krypton produced will come from the United States. The rest will come from the rest of the world, but you can still make calculations, assuming that all of the krypton stayed in the Northern Hemisphere, which is a conservative calculation, the conclusion we reach is that by the year 2000, there is less than — let's see — there is less than 500ths, .05 millirem, dose that will come from krypton to an individual, less than .05 millirem per year annually.

This compares with a number which, in this country, is about 140 millirem as natural background, if you have a guy living in a house, a little radiation in the brick, a little in the diet, this kind of thing, .05 millirem per year.

Now, this is not to say that we are trying to make a judgment at this point that all krypton for this reason should be allowed to enter the atmosphere. We have not taken that position. But we do feel because of the fact that in the year 2000 such a small amount to individuals will be the dose, we certainly don't have a problem today. I think everyone will readily agree.

I heard yesterday comments made about the fact that one of the problems may be with ALAP on reactors is maybe the values were so low now that the Commission had gone too far and you couldn't measure the stuff.

[318]

I would like to point out we are talking about doses even lower than the ones described in ALAP on reactors. So, on that basis, we have reached the conclusion that we do not have a problem at this point.

But in talking about krypton to the world's atmosphere, we have not closed the options on processes to remove krypton. It is well known that the Commission has programs to remove krypton, and we are following these very closely.

But unlike what we read every once in a while, it is stated that the problems are solved, and that we could put these in effect right now and it is strictly an economic factor, that is just not true, and I can make comments to this effect, because, as a regulatory agency, we are looking truly at the health and safety picture, not just at maybe what might seem the right thing to do at this point?

There are several problems with krypton stripping that have not yet been solved. First, chemically, there are a lot of — unlike at the reactor site, once you dissolve the fuel, there are a lot of impurities in the off-gas from the reprocessing plant, so that just to say that you can trap krypton and xenon with TNA fluorocarbon and remove it, does not say you have a safe system.

You have to prove that all of these trace impurities that are in the off-gas will not affect the **[319]** performance of your system and further, not create a hazard. You can get explosions, for example, if you trap oxidizing materials in the freon system of it, as I am sure Dr. Steindler is well aware.

Now there are programs being carried out, there is a program at Oak Ridge Gaseous Diffusion Plants, where a lot of this work was startedon krypton-xenon, to trap them, and, in fact, to study these impurities.

This is from our standpoint an excellent technical program and we are watching it very closely. Then, the question comes up, once you have trapped it, you must also strip the krypton out of the freon in a concentrated form and store it. Well, if you store it at pressure, now you have the question of whether or not you have created a problem by storing at high pressure. If you ship this out to some site, you have to have a container which will meet all of the standards on shipping casks.

I could say more about it, but fundamentally, the krypton problem we don't see at this point: tritium whole-body dose is extremely low. We have kept our options open. We have required that those plants building reprocessing plants have the capability of installing krypton treatment systems.

One company went out for a system and got five R&D proposals, so it is not like the technology is easily available. It is different from reactors, because of **[320]** the off-gas problem.

Would you want me to comment on iodine at all?

DR. STEINDLER: Well, I think the problem is iodine is a lot more chemically related. I can appreciate that

there is chemistry in iodine and there is not chemistry in krypton. I don't have a question on iodine and I don't see that the issue has been raised significantly here.

MR. SMILEY: Okay.

Does that handle what you asked?

DR. STEINDLER: That is fine.

I have one other, though.

The report is relatively silent on the topic that was brought up yesterday by Dr. Kendall, and that is the question of diversion.

It comes under the heading of safeguards. I wonder if it is not worthwhile to clarify this record for completeness to indicate what licensing procedures are followed in very broad terms that touch on the question of security?

MR. SMILEY: Well, of course, we in the Commission consider the subject of safeguards very, very important. And I might add here is another area where we work closely with the rest of the Atomic Energy Commission in terms of policy, to be sure we are getting our best information and to take advantage of research and development activities.

We recognize that you can have severe consequences [321] if you have problems in safeguards, and so we do have some rather strict rules as far as the operating plants are concerned with regard to safeguards.

And I would also like to mention at this point, and then say a little more about it, that on Tuesday, a press release was made, the title is "AEC Announces New Restrictions on Special Nuclear Materials," and it says:

> "The Atomic Energy Commission today announced a series of broad restrictions to its regulations governing the protection of special nuclear materiasl by Commission licensees."

I want to say a word about that. I think I ought to say, first, that the reason that we were rather sileng on it in this report is, as you and others commented yesterday, when you talk about the light water reactor, UO-2 fuel cycle, you don't have strategic materials, except the plutonium that is stored, and even that stuff, without really commenting further, it is certainly a strategic material, it does have 24 percent plutonium 240 in it, that burns up at about 25,000 megawatt days per ton.

But we have broad policies that we have established on safeguards and we have some very specific regulations, including technical specifications for our contractors.

For example, when we review a license application, we look at three things. We look at the safety, and we [322] certainly addressed that question in the environmental survey; we look at the environment, and that is addressed mostly in the survey; and we also look at special nuclear materials control.

Now, the AEC requires each licensee application for possession of special nuclear material exceeding 5000 grams of contained U-235, uranium 233, or plutonium, or any combination of those materials that are in what we call unsealed form to provide a detailed description of their material control and accounting systems, and these systems consider procedures used in receiving, storage, and shipping special nuclear material, procedures for controlling special material during processing, physical inventories, and then an organization in the facility, an operating organization that properly takes care of these functions.

Furthermore, the licensee must provide, by our requirements, AEC requirements, protection systems which consider control of access to radioactive material and components being protected, detection of unauthorized access, or an attempt to gain unauthorized access to radioactive material and components, communication between personnel on-site, who are responsible for protection, and those people with a local law enforcement agency which can provide meaningful assistance in a threat situation, and a response by a combination of those personnel on-site who are responsible **[323]** for protection supported by personnel from a local enforcement authority, as may be required.

Now, we have had requirements like this for some time. They are very specific for the Midwest Fuels Reprocessing Plant, which stores plutonium.

There is a buddy system; there are TV cameras; fencing; perimeter lighting, all of these things.

So, essentially, our system is defense in depth. We look at the accountability system; we look at physical protection in the plant; and we look at methods of doing something about it were anybody to try to break in and enter.

Now, I think there is a 2-page — if you will allow me, there is a 2-page summary of the new regulations which are written in about a space and a half, if I could read now, and submit the rest ofr the record, people might be interested in this.

Would this be satisfactory? These cover protection of special nuclear materials in transit also.

[324]

CHAIRMAN PAGLIN: Yes, I think it would be relevant for the participants in the proceeding to have it before

them, since it may become material in commenting in the written submissions.

MR. SMILEY: Very good. I have one more comment after that on it.

It says, "AEC Announces New Restrictions on Special Nuclear Materials.

"The Atomic Energy Commission today announced a a series of broad revisions to its regulations governing the protection of special nuclear materials by Commission licensees. The plan has been under development for more than a year.

"One amendment, effective immediately, sets forth restrictions on the transportation of plutonium and enriched uranium by domestic passenger aircraft as an added safeguard against theft or diversion.

"Other changes which are proposed and will become effective later involve the safeguarding of truck transportation of the materials and would establish tighter rules on inventory and physical protection.

"The new regulation prohibits licensee shipments aboard passenger aircraft of more than 20 grams or 20 curies," — for plutonium coming out of reactors, it turns out the burnup is perhaps one, the relationship is about 1 curie per gram. It is much higher than on 239 and lower on 238 **[325]**
because of other built-ins — "whichever is less, if plutonium or uranium-233 and shipments of more than 350 grams of uranium-235 enriched to more than 20 percent.

"The limitation on plutonium and uranium-233 are consistent with international air transport regulations governing shipments of these materials aboard passenger aircraft. They also are consistent with export license conditions

which have been imposed by the Director of Regulation since February, 1969, limiting shipments of special nuclear materials on international flights.

"AEC Chairman James R. Schlesinger said that the Commission's action, which is effective immediately, is part of an amendment to its regulations which has been under development for more than a year. In announcing the rule change, he said:

" 'While there have been no thefts or diversions involving shipments of special nuclear materials, the number of shipments will increase significantly in the years ahead and it is imperative that all possible precautions be taken to safeguard them.'

"In the past, the only significant quantities of nuclear materials handled by AEC licensees have involved low enriched uranium, used in light water power reactor fuels; the shipment of this low enriched material is not affected by the new amendment. To date, relatively small quantities of **[326]** plutonium have been shipped by AEC licensees, primarily for use in research and for small scale industrial applications such as oil well logging and neutron activation analysis.

"However, over the next several years, licensees will be handling significant quantities of plutonium to be used in the breeder reactor program and, in combination with uranium, as recycle fuel for the current generation of power reactors; in addition, as more high temperature gas-cooled reactors are placed in operation, licensees are expected to handle greater quantities of highly enriched uranium.

"In addition to the limitations on passenger aircraft shipments, the Commission also is proposing additional restrictions on motor transport of nuclear materials as part of a series of amendments to its regulations which would substantially strengthen precautions to prevent diversion of nuclear materials handling by AEC licensees. Under the proposed amendment governing shipments of special nuclear materials, licensees using trucks or trailers to ship important quantities of these materials would be required to provide an armed escort traveling in a separate vehicle or to use a truck or trailer especially designed to protect against theft or diversion.

"In addition to providing new protection for shipments of special nuclear materials, the proposed amendments would: (1) apply stricter physical inventory requirements **[327]**
to more special nuclear materials and increase the frequency and quality of required inventories; and (2) require a licensed nuclear facility to provide additional measures specifically for protection against industrial sabotage and establish areas with special physical barriers to protect special nuclear materials used, stored, or possessed.

"The Commission's action on passenger aircraft shipments is being made effective immediately because of the increased number of highjackings during the past year which have led to tightened airport security.

"A more detailed description of the effect of the proposed amendments which will be pubished in the Federal Register on February 1, 1973, is attached. Interested persons are invited to submit written comments."

I can put this in.

CHAIRMAN PAGLIN: Excuse me. What is the date of that release?

MR. SMILEY: Tuesday, January 30.

DR. STEINDLER: What is the number?

MR. SMILEY: R-36. I have copies of the actual proposed regulations if the Board would like to see them, which we can give you.

Now I would like to say this, that I think the summary hit on a point I was going to make very well. There really has been very little strategic material involved up **[328]** until now. And we have handled the work on a case-by-case basis. It is very true, and this is outside of this hearing, but organizations like NUMEC and Kerr-McGee, who are doing fuel fabrication and are handling hundreds of kilograms of plutonium for the fast breeder program, have strict regulations, protection, inventory control, and this method of contact with the local law enforcement agencies.

But we see now the growth of the industry and these new regulations are meant to show that we recognize this problem and have recognized it for some time, and now with the growing plutonium economy, perhaps, and certainly with the U-235, and HTGR, we must be aware of it, and our proposed regulations have been offered.

We plan to do more on this. Regulations are alive, you know, and we will watch them constantly, as we will in the safety and environmental areas.

I made a comment about MFRP having regulations in force. They are not running yet, at least not to produce plutonium, they are in cold shakedown. But these are the license conditions and they will be enforced.

DR. STEINDLER: I have no further questions.

CHAIRMAN PAGLIN: Dr. Geyer?

DR. GEYER: In connection with physical protection in storage, what kinds of facilities are provided? AEC doesn't have a Fort Knox installation, does it?
[329]

MR. SMILEY: No, sir. The facilities are similar to — they are right in the reprocessing plants in one case, and at a special site in New York State in another. But what we are talking about in terms of physical protection, accountability systems, et cetera, will be used. If something is in storage, there are undoubtedly special license conditions which will assure that material is what is in there. We don't have a special plant, except for the fact that at MFRP the whole thing is behind five feet of concrete, and there are special vaults where the plutonium is stored.

DR. GEYER: Were other than vault doors such as used in the banks, for example?

MR. SMILEY: I would defer to Gerry Page on that. He is the head of the safeguards branch in our organization.

MR. PAGE: The license conditions that we have been incorporating in the Kerr-McGee and NUMEC license, Exxon, Jersey Nuclear and others, require that material in storage must be protected by intrusion alarms with a specified response time. We do not specify foot foot thick walls in all cases, but we do require that this material be stored in a protected area, it be within an outer fenced area, and that it be protected by intrusion alarms tied in with a manned central guard station.

As Mr. Smiley mentioned, there must be a communication network between the plants and local police.
[330]

DR. GEYER: Do you have actual vault doors that would be very difficult to breach?

MR. PAGE: There must be doors there, and these must be of substantial construction. We do not say how thick they must be. This is something that we judge on an individual application basis.

DR. GEYER: Thank you.

MR. PAGE: In many instances they will be vault thick doors.

MR. SMILEY: I was asking him what the weight of the container was. I want to point out in shipment that this is an interesting concept, that these containers are fairly heavy, so it is not like you are walking off with something you can pick up and carry away.

DR. GEYER: What do you mean by fairly heavy?

MR. PAGE: I think perhaps what you are referring to, at the storage facility, as in New York, nearby to the West Valley Plant, the material is stored in very large containers and you need special handling equipment in order to remove the containers.

DR. GEYER: It is not in a size that they could carry out and put in the trunk of a car?

MR. PAGE: On the order of a ton.

MR. SMILEY: It is bigger than a bread box.

DR. GEYER: Thank you.

[331]

CHAIRMAN PAGLIN: Are there any other questions by the members of the Board from other members of the Regulatory Staff?

(No response.)

CHAIRMAN PAGLIN: If not, may we proceed and again the inevitability of time begins to push me.

MR. MURRAY: Mr. Chairman, I would like to note the Staff will be available, should questions arise later on today.

[332]

CHAIRMAN PAGLIN: Yes, that is our understanding, thank you.

We would like to proceed to some, I won't call it questioning exactly, but discussion with Mr. Roisman at this stage. The members of the Board have some questions of him. Again I will try to proceed as expeditiously as possible in order to accommodate all of the participants in today's hearing.

Mr. Roisman, I think it would not serve any particular purpose for us, myself and yourself as lawyers, to engage in a legal debate at this particular hearing. However, I would like to raise some points with you, those made in the course of your remarks yesterday, and more in terms of having both yourself and the other participants, when they submit their written submissions at the conclusion of the oral hearing, to address themselves to these matters as legal propositions.

You indicated, and quite rightly, that these are critical matters, procedural matters, but nevertheless critical matters. There are some legal questions involved, not necessarily as I see them as a matter of authority of the Commission, but perhaps more so in terms of the visibility, the desirability, and the necessity of the procedure involved.

I have particular reference to the fact that you referred yesterday, Mr. Roisman, to — I think you put it the public demand a generic hearing with full rights of **[333]** discovery and cross-examination.

May I observe by way of footnote, I take it you mean the public in terems of your role or the role of your organizations as private attorneys generally, not necessarily the vast mass of the public, because I take it you would agree with me none of us come with a diploma of divine guidance signed by the Lord God Jehovah. None has that, we are all mere mortals looking for guidance in this matter.

But what I would like to have you address briefly now and perhaps more extensively in your paper is, first, I take it you would recognize legally there is a distinction with respect to the authority of the agency to hold a legislative type hearing under the Administrative Procedure Act as against an adjudicatory hearing.

Would you also concede that the cases hold — again this is not a legal debate, I'm just making the point and I would like the others to address themselves to it in their perhaps memorandum of law which will be filed — that the courts, including the Supreme Court, have held that due process does not necessarily require full evidentiary hearings, full cross-examination, full discovery in every instance.

In other words, the Supreme Court has said in the Morgan case what due process is, what it requires. What I'm getting at, Mr. Roisman, is I would like for you to treat the **[334]** matters of what you define as "a generic hearing with full rights of cross-examination and discovery" as against the authority of the agency to have a policy-formulation proceeding in the mode of something other than a full-scale evidentiary hearing where it is not required by the statute.

Have I gone on too long in that "question"?

MR. ROISMAN: No. I will of course address it in written comments, but to begin with of course there is no dispute with the proposition that an agency does have the authority to conduct a legislative type proceeding such as this one, which includes no rebuttal, no cross-examination, no discovery, and is like hearings before Congressional committees. The issue of course if whether or not this hearing can serve as the hearing with regard to the substantive documents, the survey of the environmental effects of the nuclear fuel cycle.

There is no doubt that it is an appropriate hearing for the Commission to make up its mind which procedure to put into effect. And that is why we made no objection to the conduct of this hearing in exactly the form it is in.

We are here to urge the Commission to hold a substantive type hearing, adjudicatory in nature, as the rule that it ought to adopt. But there is the implication and we think the implication is subject to some debate in the Commission's Alternative Number II — as you understand, we reject **[335]** Alternative Number I on the purely legal grounds that we don't think it meets NEPA — but there is an implication in Alternative II that the documents we have been discussing may, following this hearing, become a complete statement of the environmental effects of the fuel cycle, and not the subject in an individual licensing proceeding, when that data is read into the impact statement, to cross-examination or discovery.

Now the phrase in question is at the very end of Alternative Number 2, as it appears in the Federal Register, in the third column, page 24,192. It states in part —

CHAIRMAN PAGLIN: It has so many phrases, why don't you just start ". . . shall be as set forth."

MR. ROISMAN: That's right.

"The environmental costs of licensing the nuclear power reactor shall be as set forth in the following Table S-3 of the Commission's Environmental Survey."

Now if the term "shall be as set forth" means shall be and not subject to any questioning, that would seem to me to eliminate the right of an adjudicatory hearing on the substance of what appears in Table S-3. That we would say would not be within the Commission's discretion, since they would have instead of taking a matter which is subject to rule-making, appropriate for rule-making, would have taken a substantive matter that would appear in an impact subject **[336]** and assumed it to a non-adjudicatory hearing, namely this discussion, and fed that back into the impact statement and insulated it from discovery, cross-examination, and rebuttal and the like.

It is equally subject to the interpretation that all the Commission is saying is when the Staff prepares its impact statement it will take Table S-3 and put it in and as you know, everything the Staff puts in the impact statement is then open to contention in an individual licensing proceeding and you would be able to come in and say, "Staff, we have seen your fellow documents, but we are still not persuaded, we want to see this and this underlying document," and eventually the appropriate contentions are made, conduct cross-examination of the Staff on that.

If that second interpretation is the right one, we feel it would produce an incredible burden on the Commission and one it shouldn't have to take on, because you then would have the problem of repeating many of the same questions and issues and contentions in every hearing; you are talking about the same general group of reprocessing plants, the same group of uranium mills, et cetera.

For that reason we urge and we note that many people in the industry support the concept of the generic type hearing, that it be done in the generic form. But even if it were in the discretion of the Commission to choose to do this **[337]** particular matter in the legislative type hearing route, we also make the point that we think that that is not a wise choice for the Commission to make if it is attempting to exercise its discretion.

There is, as I pointed out before, and I don't think this is a fact which can be disputed, a distrust in the country, at least in segments of the country, of the Commission and its statements and the industry and their statements regarding the safety and the reliability of nuclear power plants.

To the extent that the Commission forecloses full public discussion, forecloses the opportunities to cross-examine and discovery with regard to the issues, it tends to exacerbate those public doubts. To the extent that it opens them up to fuller explanation, real problems that do exist come to the fore, and false ones, which appear to be there, but weren't in fact there, are laid to rest.

And so we believe that even if the Commission did have the authority to take this fuel cycle report, subject it only to a legislative type hearing and then bind the participants in an individual licensing proceeding to its contents, that wouldn't be a smart course of action or one that would best serve the public interest.

Now of course I would be happy in our legal submittal to discuss the question of why I think the Commission does not have the discretion, and why I think that this document, **[338]** as opposed to the rule-making on which

procedures to follow, this document must at some stage in the procedure be subjected to the full adjudicatory rights under the Administrative Procedure Act.

CHAIRMAN PAGLIN: In other words, what you are in effect I think saying is that the Kenneth Davis concept — Forgive us, please, two lawyers talking about these things — the legislative fact against the adjudicative fact.

You are saying there should be an opportunity to challenge the accuracy of the data upon which the Commission would want to act. On this I have no quarrel. Again I would like the participants to address the matter as a legal subject in perhaps a memorandum of law to the Commission, because as I see it, as I mentioned during the procedure planning session in January, to me, — forgive me for repeating it — the name of the game in rule-making is not only to permit interested and affected parties to comment on the proposed rule, but also to assist the agency in reaching as fully informed and as valid as possible a decision.

I frankly, Mr. Roisman, do not see this in terms of antagonists or adversaries. I would say parenthetically for 28 years I worked for another Government agency in the regulatory field which was always referred to as the "big bad FCC." It was with some chagrin I heard you yesterday and it made me think I'm now working for the big bad AEC. I don't **[339]** think that is a fact.

Again not to be facetious on such a serious subject, we are all in this together and we are trying to find the most valid route. I think that acrimony and condemnation — again I'm making personal comments — do not exactly help an agency in reaching an informed decision.

The points I think you agree with me on are to show

the road to the Commission that if in fact it needs further proceedings of a particular nature in order to realize the validity of the facts on which it wishes to act, this is the route it should go as a legal matter. I don't think we disagree on this.

But I think it would be helpful to lay it out as a legal matter by all of the parties for the Commission, so it can arrive at an informed decision.

MR. ROISMAN: Mr. Chairman, if I may, just one comment. I think that first of all the question of is the AEC a bad bunch of people, that implies again some statement about motive and we have not gotten, nor are we attempting to get into the question of motive. I don't have any doubt that the people —

CHAIRMAN PAGLIN: I would hope not.

MR. ROISMAN: — the people in the Commission do what they do out of conviction.

Let's say our position is they are misguided in **[340]** some respects, but not that they are in any respect immoral.

CHAIRMAN PAGLIN. Mr. Roisman, so long as you recognize that the ultimate doom, that big cloud, would envelop not only the members of the Commission, the Staff, but all of us, so we are all involved.

MR. ROISMAN: Absolutely.

But I think also your experience in the Federal Communications Commission— I'm sure you are aware it took the then Judge Burger, now Chief Justice, to say not once but twice in the Office of Communications of the United Church of Christ that an intervenor was not to be treated as an interloper, but was to be treated as someone who has something to contribute.

CHAIRMAN PAGLIN: Absolutely.

MR. ROISMAN: I don't know that one may say the Calvert Cliffs decision was the Commission's Office of the Church of Christ, it may be the Commission still needs one.

In any event, I think it merely proves that even well-intentioned agencies can, over a period of time, begin to drift away from serving the public interest and it is not unlikely that someone has to give them a slap on the wrist. That has been the courts in the past and it may have to be courts again in the future.

CHAIRMAN PAGLIN: You will admit however you now have had your forum to make this statement, in terms of on the **[341]** record.

MR. ROISMAN: Oh, yes.

[342]

CHAIRMAN PAGLIN: Let me address one more question, Mr. Roisman, and this is likewise to the other participants, again.

I gathered, from your remarks at the opening before the testimony of Doctors Kendall and Radford, that your group, at least, was saying that — perhaps, I am oversimplifying it — that there should be a cessation of all activity in terms of developments of nuclear energy until certain safety features could be assured.

What I would like for you to address yourself to, in your paper, is whether or not you think this proceeding, Number One, and Number Two, the Commission testimony, is the proper forum for the determination of a matter of national policy of that kind, or are you speaking of addressing the Congress when you, in effect, assert that there

should be, as I read it, a cessation of the developments of nuclear energy as an energy source.

I say I don't think, at this stage, perhaps, you will will agree with me, Mr. Roisman, that it requires response by you. I make my point, and I would like to see it developed, because I think, again, it is a critical point in terms of the appropriateness of the forum.

MR. ROISMAN: If I may, Mr. Chairman, since you do raise the question of Congress, and since many of our participating organizations are tax-exempt organizations, I don't **[343]** want to leave any misimpression on the record. It is our opinion that the Commission's responsibilities, under the Atomic Energy Act, as written, gives it the authority, if it feels that sufficient safety does not exist in the industry, to simply stop licensing plants.

It would either do it on a generic basis, if it were a generic problem, or a case by case basis. It is not necessarily a legislative solution. But, I will address that in detail, and cite references, and so forth.

CHAIRMAN PAGLIN: Thank you, Mr. Roisman.

Dr. Steindler, I think, has some questions at this point.

DR. STEINDLER: Perhaps they are not so much questions, but, perhaps, an attempt to provide for the Commission, some clarification in the transcript. Is it reasonable to assume that the points made by your group, Mr. Roisman, include for example, the following; and I am sure you appreciate I am trying to address myself to the more technical aspects, rather than procedural: The fuel cycle — is it reasonable to assume we can attribute to your group, the opinion, that the fuel cycle documents, as written, and as presented, here, is (1) Too narrow in scope

and should include the reactor as well; and (2) Is too narrow in scope, and should include in detail, such things as ultimate waste disposal?

Let me stop there, and ask you to respond to that?
[344]

MR. ROISMAN: Yes.

DR. STEINDLER: That is a fair statement, okay?

Now, if this fuel cycle document should include the reactor, as well, I presume that you would try and treat the reactor as a generic beast, as we treat the fuel cycle bits as generic beasts.

Is it your contention that that is a feasible way to proceed, recognizing that ultimately, the reactors are different by virtue of their location, their type, et cetera?

MR. ROISMAN: Yes. I think — I said this yesterday — certainly, there are site-related characteristics, and also differences; boiling water, pressurized water, size, and even within pressurized water, not only two manufacturers, but different designs from the same manufacturers; which are not suitable to a generic hearing.

But, on the other hand, we have already participated in two hearings which do relate to reactor questions,, namely, emergency core cooling system, and as low as practicable. And we feel that there are other subject areas which are equally generic in nature.

I am not nearly in a position, primarily because of technical limitations to give you other examples, of places where, I think, that this can be done. But, we know that there are common elements in reactors, similar pumps, you may have seen if you are on the most-favored, mailing lists

of the [345] Commission that in the last six or eight months, a number of letters have been sent to reactor operations, or people with construction permits, that dealt with the identical problem, and it was the same letter sent to each one of the utilities: teh steam line running problem, the problem associated with fuel densification.

These are problems which at least suggest that there are generic type resolutions of these problems, and we are, despite some imtemperate comments, to the contrary, in no way interested in having these decisions take very long, because we feel that if those decision prove that nuclear power is not a good solution; we want the country to turn its substantial resources toward the alternative sources of power before it is too late.

DR. STEINDLER: Let me, from here, split into two other questions.

I think it was pointed out, yesterday, and I don't think there is any tremendous disagreement, that the ultimate perpetual storage problem is one that is not soluble at this point in time, because it is not definable.

You indicated, because of your philosophical background, you have some problems with that particular concept. I also then would like to turn this around, and wonder whether or not your group would view the problem of not having terminal disposal capability clearly identified at this point — I might [346] add, I also have a philosophy background, and I have the same kind of problem in saying that today we are able to do something for all time.

But, if we don't have the terminal disposal of one of the aspects; namely, the fission product wastes, completely solved at this point, does that represent to your group, a

sufficient reason to stop everything until we can accomplish what I think may well be not difficult and impossible?

It is a question I tried to address to, I think, Dr. Kendall, and I am not sure I got an answer to that.

MR. ROISMAN: Let me see if I understand it. If the premise is it will probably be impossible to find adequate permanent storage of wastes, given what we all know about the potential damage of wastes, I must say I would be surprised if any members of our group; although I have not polled them on the question, so I won't try to speak for all 81 member organizations, but I would be surprised if any of them would vote to go ahead with nuclear power.

If the premise is, we don't now have a solution, but we have a very strong indication that we will have a solution ten years from now when we need it, would you stop; again, I can't speak for every member of the group, but I can certainly speak for the — can certainly speak for the Board of Directors of Consolidated National Intervenors, and for the members of the Union of Concerned Scientists, who have participated in **[347]** this proceeding, Dr. Kendall and Radfor, that under those circumstances, there certainly needs to be a severe re-evaluation of the question of proceeding with the developments of nuclear power.

Again, given the initial premise, what we know about the dangers associated with nuclear wastes, can we, in good conscience, proceed with it. And, that does involve, to some extent — and this is where you get not only into the Atomic Energy Commission Act, but into the National Environmental Policy Act, also — a really basic kind of cost-benefit analysis, again, under the premise that we adopt now, have a solution to the long-term storage of nuclear waste, permanent storage.

But, we have indications we will have it sometime in the foreseeable future. And, if we have alternative sources of electric power in the country, and alternative ways of supplying our demand by reducing demands or increasing supply or both, then you are faced with a much different set of options than if the situation is one in which you could say, conclusively if you didn't have nuclear power; you could not, say, run iron lungs in hospitals.

Our own position is that the latter is not the case, that there are enormous options still open to the country in terms of electric energy, that as we continue down the nuclear route, many of those options get foreclosed, simply **[348]**
because when its current gets 10 or 15, or 20 percent of its electric power from nuclear plants, instead of the one or two percent, it has, now, it is more difficult to turn that off, and find an immediate replacement for it.

DR. STEINDLER: I think the thing that concerns me is we get into a position where we don't cross the street, because we don't understand, fully, how the stop-and-go light works, if you will pardon that analogy.

The problem I am trying to address myself to is to get from you, a definition of how you view the problem of waste handling? Is it in the judgment of your group, mandatory that the "ultimate disposal problem," in fact, be attacked at this point in time?

MR. ROISMAN: There is no doubt about that. I mean we start from the premise that if this were a red-and-green light situation, it would be a much different situation. We are talking in terms of the nuclear waste problem, with dangers to the entire world, and the world population.

Given that those are dangers which, but for nuclear power plants, would not ocme into existence, that is, you

are talking about not naturally occuring waste products, we think one must face that question and must have something concrete in the way of a solution available.

At this time, all we can do is examine what has been the past history of attempts to solve the problem and they have **[349]** not been particularly good. Lyons, Kansas turned out not to be what it was cracked up to be, and that did not instill much confidence in us.

DR. STEINDLER: I am trying to draw a distinction between the disposal of waste in an irretrievable, out of sight, out of mind approach, versus the disposal wastes in a retrievable and desirable fashion, where, in fact, you pay attention to it.

Both of those obviously represent viable long-term solutions if you are willing to pay attention to them. I don't want to get into the philosophy of Weinberg's Legacy, which is another topic, altogether. All I am trying to distinguish is whether or not your group considers the disposal problem in which you, in fact, drop your wastes into a situation where you pay attention to them, does this represent, to you, an adequate long-term, not infinite, but long-term solution to the disposal of wastes?

MR. ROISMAN: I think at that point, you have crossed beyond my expertise. I can give you some of the considerations, but I don't feel competent to give you an answer.

DR. STEINDLER: Fine. Let me suggest that that issue has come up sufficiently so that, perhaps, a short comment consequently in your written material would be worthwhiel. I think this is the fundamental issue. I may have it not quite clarified, but I think that is one of the fundamental issues.

[350]

MR. ROISMAN: What bothered me the way you framed it was it is difficult for me to comprehend the question without including Weinberg's priesthood. I always thought what Weinberg was calling for was an international organization to which everybody in the world would belong; all of our ancestors would be keepers of the nuclear waste mound, of which we all are charter members.

I do think you cannot answer the question if you say the solution is long-term surveillance, without saying historically, how long have we been able to keep our eye on things, King Tut's tomb, and some of the other pyramids are just one of the examples of things in which one society attempted to set something aside and say, "This is inviolate, nobody is to get into it," put curses on it, and so forth, and consequent societies did not believe that.

I think we feel fairly confident, at this point, and I don't have any doubts about the technical theories that those wastes would be extremely hazardous and lethal if they got released. We don't want some future generation, for whatever its reasons, to decide, "Gee, we have been working in the these mounds for 250 years, let us leave them alone. Nothing can happen here." And, then, of course, something would happen. And, I just don't think you can separate the philosophical question from the reality question.

But, I understand your question, let me see if I **[351]** restate it correctly, if there is a long-term surveillance solution to the waste disposal problem, would our organizations oppose that and say, "No, no surveillance to the waste problem is every going to be a viable alternative," and the only solution must be a nonsurveillance solution.

Does that state what you are asking, basically?

DR. STEINDLER: In effect, that is what I am asking. And particularly, don't extend the tempered into infinity for the answer, even, you know, Christianity, as long as it has lasted, has had some alternatives provided for it by others, no matter what you think of them.

So, we do set up things, we do set up religions, and I didn't want to get into Weinberg's priesthood, but we do provide alternatives on occasion which some of us feel are just as viable as the others.

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MR. ROISMAN: We will try to keep it within a thousand years or so.

DR. STEINDLER: Fine. I have one other question as a matter of procedure. A great deal of the discussion could have centered in this particular hearing around the technical detail of this document.

Unfortunately, we avoided that, otherwise, I think we would be here for a prolonged period. However, you indicated repeatedly and emphatically that cross-examination and what is termed the right of discovery, which I don't understand, but I don't need a clarification on it now —

CHAIRMAN PAGLIN: I will tell you about it later.

DR. STEINDLER: Right. — is a process which you feel to be the best way to arrive at the truth, I think. Coming from a scientific domain, I understand cross-examination to be a strange way of arriving at the truth. I think there are probably more efficient ways which are divorced from the personality cult which cross-examination could possibly be interfered with.

Is it not possible, as far as you are concerned, that those aspects which represent technical matters, not judgment

matters, but technical matters, could not be resolved in a way in which you say a referee referees a journal article in the scientific field or on a more impersonal and technically related mechanism? Would you not **[353]** think that would be perhaps more appropriate, or at least an equally useful way of settling a large bulk of the problems that perhaps pertain to the technical deficiencies you might see in this document?

MR. ROISMAN: Let's see. I guess I can start with the legal comment that ours is a nation of laws, not of men. The principle is if you go through the proper procedure, you have a higher probability of finding the truth. But there is no doubt on certain technical problems, maybe on many of them, that an alternative forum is the kind of forum in which two technical people, or five, or whatever the number is, sit down with someone there who is competent and unbiased and who simply says, "Wait a second, you are missing an issue, talk about that as well, to work something out." I think we have discovered in the emergency core cooling system hearings that to some extent that is true in this respect. When the hearings began the Commission had a panel of experts that they put up as their panel to testify and they were subjected to cross-examination. As the hearing proceeded, it was uncovered that there were other experts not sitting up on the panel, but also Commission personnel, who worked either at the National Laboratories or within the Commission, who had differing views, and there at least began to develop a feeling that perhaps what we saw at the cross-examination stage at the beginning in terms of the Commission's panel **[354]** were people who were reviewing other people's work and putting their own interpretations on it, and that what we found ultimately were the people who had actually been involved in the work,

further removed from policy considerations, and further removed from the secondary interpretations of what somebody is doing.

If you can have a discussion at which all of the "principals" are involved, and in which there are no limits — as you know, the Commission is a schizophrenic organization and it has this dual responsibility to promote and develop nuclear power. If you could take that away, my own experience has suggested that as you move further from the center of gravity, literally geographically speaking, further from Washington, there is a greater tendency for the policy and the promotional side of the Commission to influence what happens and therefore discussions with people from National Laboratories who work with the same subjects that people within the Commission worked on tended to be franker. That is a prerequisite, the frankness of the conversation.

In addition, we have got to remove the inate bias that people have. One of the purposes of cross-examination is to expose the bias, so that when a man says on the witness stand the consequences are small, or that the figures fit well, what does he mean when he uses the word "small" and what does he mean by a good fit.

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Ultimately, all language, going back to the philosophy, unless we think that Bertran Russell really came up with the perfect language, which I don't, has to have qualitative terms in it. One purpose of cross-examination is to expose what assumptions underly the qualitative terms. You spoke yesterday about the question of what assumptions underly this document. Cross-examination would be one way to get at that. I don't think that cross-examination need either be a conflict of personalities, nor a situation of acrimony. I have seen it both ways, with similar participants involved.

It can be a useful exercise in which both people are trying to explain their positions and the questioner simply helps them.

Obviously the technical questioner is more appropriate for the technical witness and we have favored that whenever we have technical expertise. You understand our groups have been limited by much smaller technical expertise, so, to wind up a long answer to your question, I am not opposed to the principle of something other than cross-examination to get at these and I would be perfectly willing to try it as an alternative, but being a lawyer, without waving my right to cross-examination.

But if the Commission wanted to take the fuel cycle question and say it looks to us like this is one particularly suitable to this kind of thing, and we are **[356]** prepared to call in all of the people who have something to say on this subject and start the discussions, I think we would be willing to start that, and if that came up with what we thought was a thorough examination of it, we wouldn't go through the incantation of discovery and cross-examination merely for the sake of it. It is a tool to achieve something, not an end in itself.

DR. STEINDLER: Fine. I think the only reason I bring it up is because I have been involved in processes where it is not cross-examination, but just the kind of thing you are talking about, where five guys sit around the table and, in fact, hash out very seriously a technical problem and arrive at a consensus, where these five represent at least two sides, if not three, they have done it successfully. We have done it within the Commission and without the Commission. So I think there is some advantage, if that represents a meaningful way, as far as you are concerned, of posing that as a potential solution to some problems, put-

ting it in the record and letting the Commission mull over the approach here that they might choose to adopt.

MR. ROISMAN: I will ask our technical people if they have any comments on this to include those. Your mention of five people sitting down with three views, you see, if it were five lawyers, they would have seven views, and that may be the difference between our disciplines.
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DR. STEINDLER: Yes. That is all I have.

CHAIRMAN PAGLIN: Dr. Geyer?

Again by way of footnote, this is an example of what I was referring to, Mr. Roisman and the others, please do not hesitate to use ingenuity in terms of suggestions for procedures to assist the Commission in this very complex task.

If Mr. Wiggin would permit me, I would like to call for a moment on Mr. Murray. Mr. Murray, there is no Section 315 of the Communications Act here, or any requirements for eaual time as such, but I do feel elemental fairness requires you be permitted some comment at this stage.

MR. ROISMAN: Excuse me, do I understand you are allowing staff rebuttal, and, if so, when may we have rebuttal?

CHAIRMAN PAGLIN: No, it is just a question.

MR. ROISMAN: I hope there are no questions by any participants. I understand that has been ruled on.

CHAIRMAN PAGLIN: No, it is a question.

MR. MURRAY: I understand you were asking me a question and I was prepared to respond.

CHAIRMAN PAGLIN: Would you go ahead. This is not rebuttal, no, sir. I have some comments at the end before we close the hearing about this.

MR. ROISMAN: What is the question Mr. Murray is
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responding to?

MR. MURRAY: The same one you were asked, I assume.

CHAIRMAN PAGLIN: Yes, about procedures.

MR. ROISMAN: Thank you.

MR. MURRAY: Mr. Chairman, we feel that these hearings are being held to obtain the views of anyone and everyone on the light water fuel cycle, which doesn't involve any shipments of plutonium or highly enriched uranium. We also feel that these hearings are being held to obtain even eroneous views of anybody. However, when we get views that go far beyond the proper scope of this hearing and they are eroneous, we don't quite know what utility to make of it. We have heard nothing whatsoever contravening any of the factual information in the survey. That is what this hearing is for. We haven't heard — we have heard a lot of philosophy about what we ought to be doing, but we haven't heard anything attacking the factual basis.

In the absence of any factual contraventions, Mr. Chairman, there is no reason for a judicatory proceeding. That process is for getting at facts, not for dealing with philosophical questions, as was shown in 122 days of hearings in ECCS. We have heard the ECCS hearing retried here and mischaracterized, the same with the as low as practicable hearing. But we haven't heard any factual contravention of the documents.
[395]

CHAIRMAN PAGLIN: Well, I would expect, Mr. Murray, that that is what I was referring to when I said in the written submissions, if you can raise the questions with respect to the factual validity, this would be assistance

to the Commission. It would then point the way as to what further procedures may be necessary.

MR. MURRAY: Mr. Chairman, Mr. Smiley has a point he wants to add.

MR. SMILEY: The question of small and these other descriptive words has come up, and I would like to clarify that. The words are used through the text. But I would like to make it very clear, there is a summary table in the front, Table S-3, which appears in the *Federal Register* notice. It doesn't appear in its entirety in the *Federal Register* notice, only the radiological considerations had additional comments, if you recall, the nonradiological did not. We may have used words like "small" and "insignificant" in the text, but in Table S-3, we took every factor, and we characterized it in some form, so someone would understand what that means.

For example, under the radiological, under "Gas, including entrainment," it will say "tritium," for example, principally from fuel reprocessing plants, whole body dose 4.4 man rem for population within 50-mile radius. This is less than 0.005 percent of average national background dose —
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CHAIRMAN PAGLIN: Excuse me, Mr. Smiley, I don't think it is quite important to make this point at this stage. I think this point can be made in your responding papers. You are responding to Mr. Roisman's characterization, I understand that. But I don't know whether it is relevant at this point.

MR. SMILEY: Fine, we will make it in writing.

CHAIRMAN PAGLIN: Please do.

I want to ask Mr. Wiggin what is his preference? He is now scheduled to proceed. They have 90 minutes. Would

you prefer to start now and take a breat at 11:00 or prefer to take a break now?

MR. WIGGIN: Take the break now.

CHAIRMAN PAGLIN: Fine. 10-minutes.

(Recess.)

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CHAIRMAN PAGLIN: May we resume?

We will now hear from Mr. Wiggin on behalf of the Atomic Industrial Forum.

Mr. Wiggin.

STATEMENT OF EDWIN A. WIGGIN, EXECUTIVE VICE PRESIDENT, ATOMIC INDUSTRIAL FORUM

MR. WIGGIN: Thank you, Mr. Chairman.

I am Edwin A. Wiggin, Executive Vice President of the Atomic Industrial Forum and also I am Secretary of the Forum's Committee on Nuclear Fuel Cycle Services. It is in that capacity that I am appearing here this morning.

This statement is based in part on the input of the Steering Group of the Nuclear Fuel Cycle Services Committee. Our statement also includes the input of the Forum's Mining and Milling Committee. Mr. George L. Gleason, Vice President, Program Director and Staff Counsel of the Forum, is with me and will address the procedural aspects of our statement, when I finish the technical portion.

The Forum is a not-for-profit membership association incorporated in the State of New York. Its members comprise some 550 corporate and institutional members in the United States as well as in some 25 other countries, all of which share a common interest in the development and application of atomic energy for peaceful purposes.

Because of the diversity of its members, which [398] include utilities, manufacturing companies, universities, labor unions, professional firms, financial institutions, government organizations, and other profit and non-profit entities, the Forum, as a matter of policy, does not take independent positions on matters pending before the Congress or pending before other public interest and quasi-judicial bodies such as this Board; however, whenever possible we do make an effort to identify relevant technical, legal and policy considerations and to provide a mechanism for determining and articulating the views of our various members.

The question before this Board is whether the environmental effects associated with the uranium fuel cycle should be considered in individual light water power reactor licensing cases. In its implementation of the National Environmental Policy Act, the Atomic Energy Commission has concluded that environmental statements for a power reactor should not only weigh its potentially adverse environmental impacts against its environmental, technical and economic benefits but also quantify to the fullest extent practicable and incorporate in the environmental statement a cost-benefit analysis of related factors.

It will be the responsibility of this Board to assemble the evidence that will permit the Commission to determine whether a related factor to be so considered is the uranium fuel cycle. A further question facing this Board and the [399]
Commission is the manner in which this should be done.

An Endorsement of Approach.

We endorse the Commission's generic approach to resolving these issues, as we did its approach through rulemaking hearings to the problems of setting low as practicable limits on radioactive effluent releases and establishing

ECCS criteria. Indeed, in keeping with a long-standing recommendation of our Lawyers Committee, we believe that the Commission should seek additional instances in which its regulatory requirements can be established by general rule rather than on a case-by-case basis.

The Commission's Regulatory Staff has prepared an "Environmental Survey of the Nuclear Fuel Cycle" to serve as a basis for determining if and in what manner the environmental effects of the uranium fuel cycle should be included in the environmental statements of power reactor license applications. Further, the Commission has proposed in amendments which it is considering making to Appendix D of 10 CFR Part 50 and which are described later in this statement alternative ways in which this might be done.

Scope of the AEC Staff Survey.

Since the Staff survey provides the bases for both of the alternatives set forth in the Commission's proposed amendment to Appendix D, it would appear appropriate to address the survey before considering the merits of the two [400]
alternatives.

In its survey, the AEC Staff has considered the following elements of the fuel cycle: mining of uranium ore; milling and refining of the ore by uranium concentrates; production of uranium hexafluoride feed; enrichment of the gaseous diffusion process; fabrication of reactor fuel; reprocessing of the irradiated fuel; management of radioactive wastes; and transportation of various fuel forms from one phase of the cycle to another.

We will want to speak to each of these steps. We will also want to comment on several elements of the nuclear

fuel cycle which the Commission, following the lead of its Atomic Safety and Licensing Appeal Board, has determined should not be included in this general rulemaking hearing, but instead considered in the individual environmental statements of reactor license applicants, including transportation of nuclear fuel from the manufacturer to teh reactor; the shipment of irradiated fuel from the reactor to a fuel reprocessing plant; and the transportation of high- and low-level solid wastes from the reactor to federal depositories.

Finally, we will want to comment on three additional aspects of the nuclear fuel cycle which the Commission has indicated it will consider at a later date, presumably when they become more significant factors in license reviews; specifically, plutonium recycle in the present generation of [401]
light water reactors and the fuel cycles for gas-cooled and fast breeder reactors.

A Commentary on AEC's Model Approach.

In attempting to come to grips with the magnitude of the task involved in assessing the over-all environmental impact of the nuclear fuel cycle as it pertains to the licensing of reacto-s, the AEC Staff has chosen a "model" approach. Such an approach, however, is not without certain shortcomings. For example, the "model LWR" is neither a pressurized water reactor nor a boiling water reactor, but combines certain characteristics of each in such a manner as to postulate a maximum environmental impact from the fuel cycle facilities supplying materials and services.

Similarly, the AEC survey employs model fuel cycle facilities which in some instances combine alternative processes and operations used in as many as three different

plants, all designed to serve the same purpose. As the AEC Staff has pointed out, "where the nature of the impact from two or more modes of operation differs significantly, the aggregate operation of all plants, normalized to an appropriate annual capacity, has been selected as the model fuel cycle facility . . . The models were selected to be representative of the industry and to lead to conservative or pessimistic assessments of the environmental considerations."

Adoption of the model approach, it seems to us, [402] imposes three obligations on the Commission. First, it must be established that the models selected in each of the fuel cycle steps do, indeed, lead to conservative or pessimistic assessments of the resultant environmental impacts.

Second, the AEC has stated that "the model fuel cycle facilities are not intended to represent particular plants." It should be clearly established in the record of this proceeding that the data characterizing the natural resource use, the gaseous, liquid and solid effluent releases, the radioactive materials release, and the thermal discharges, on either an individual or industry-wide basis, will not necessarily serve as applicable or appropriate guides in the licensing of specific fuel cycle facilities. The report indicates this to be the case and the Staff has so testified.

Third, it should be made clear that to the extent the model approach leads to what may appear to be inconsistencies between parameter numbers characterizing the model and parameter numbers characterizing a specific fuel cycle facility, such inconsistencies have arisen simply from an effort to be conservative and do not compromise the value of the conclusions reached.

Uranium Mining.

In its survey, the AEC staff has chosen as its model uranium mine an open pit mine in contrast to an underground mine on two premises: (1) that about half of the
[403]
known uranium reserves in the U. S. are located in relatively shallow — less than 400-foot deep — sedimentary formations and (2) that the environmental effect is greater in terms of the total volume of earth disturbed.

In comment, we would observe that the future fuel requirements of nuclear power reactors will depend — and this was indicated yesterday — to an increasing extent on uranium reserves that have not as yet been confirmed, i.e., on uranium ores that presumably will be found as the result of current and future exploration efforts. The trend of recent exploration findings is that a significantly greater proportion of uranium reserves now being proven lie well below the 400-foot level and hence must be recovered by underground mining operations.

As the AEC survey, itself, points out "a greater fraction of the ore mined in 1980 may come from underground mines." Hence, to the extent that underground operations impact less severely on the environment, the relative impact of future mining operations should be less than those postulated in the AEC survey.

Although we would acknowledge that the area of land described in the AEC survey as permanently committed is some 50 times greater in an open pit operation — 2.0 acres versus 0.05 acre to meet the annual fuel requirements of the 1,000 Mwe LWR model — we question whether any land is permanently [404] committed when land reclamation practices, as now required by many states, are followed. Further the trend of state and federal legislation appears to be to require complete reclamation of all lands affected by any type of mining operation.

Commenting further on the AEC survey's model open pit uranium mine, the Forum's Mining and Milling Committee has noted that the 1,500 gallon per minute water drainage is a higher rate of discharge than has been experienced in open pit mines currently in operation. Also, depending on the relative location of the mill serving the mine, the discharge water may not be released to the natural surface drainage system, but instead used as mill process water. In this case, it is ultimately impounded with the mill tailings.

Even though precise data may not be available, the Committee has suggested that the AEC survey summary on effluent releases should perhaps include an estimate of the radioactive materials released to the atmosphere as a result of open pit mining operations. The Committee points out that the principal radioactive nuclide released in radon-222 and while the rate of its release will depend on the surface area of ore exposed, it is conceivable that the amount released could be equal to that released from a comparable quantity of mill tailings.

However, the concentration of radon-222, as well as the concentrations of other airborne radionuclides in unrestricted areas, i.e., 600 meters or more from the point of
[405]
release, would be expected to be undetectable.

The AEC survey points out that approximately 250 megawatt hours of electric power are consumed in an open pit mining operation, primarily for the operation of dewatering pumps, to meet the annual fuel requirements of the 1,000 Mwe LWR model. On the assumption that the electrical generating capacity is coal-fired, the AEC survey cites a level of resultant SO_x, No_x, hydrocarbons, and CO effluent releases.

The Forum Committee points out that in an underground uranium mine of comparable size, power consumption would

be higher by a factor of 20 or more because of the heavier power demand of ventilation equipment. In such cases, the chemical effluent releases would increase by a comparable amount.

Although the AEC survey does not address the problem because it cannot be considered an environmental problem impacting on the general public, publication of the survey has raised again the question of the hazards to underground radiation miners from exposure to decay daughters of radon gas. As of July 1, 1971, the permissible radiation exposure for mine workers was dropped from a standard of 12 working level months — WLM — to four WLM per years. A WLM is 170 hours' exposure, or its equivalent, to one WL of activity which in turn is defined as 300 picocuries, one-billionth of a curie or 660 atomic disintegrations per second — per liter of air.
[406]

Through a combination of ventilation equipment, electrostatic precipitators, and respirators used in conjunction with brattices and stoppings and the maintenance of negative pressure air flow behind stoppings, it has been possible for most uranium mines to meet the new standards. It is significant that available data shows that in terms of the amount of electric power generated versus the number of employee fatalities from all causes, it is safer by a factor of four to 20 to work in an uranium mine than to work in a coal mine.

Uranium Milling.

The Forum Committee on Mining and Milling has concluded that the AEC survey adequately covers the uranium milling step of the fuel cycle. It concurs in the selection of the acid leach process for the model plant because of its predominant use over the carbonate leach process and

agrees that the acid leach process will impact more significantly on the environment.

As the survey points out, a carbonate leach mill uses less than a third of the water that an acid leach plant uses and hence the amount of water discharged to the air in the carbonate leach mill is much less. Also, a carbonate plant recycles the leach solution whereas the model acid leach plant does not.

And finally, the carbonate leach mill recycles tailing pond solution back to the mill for pulping the filter plant [407] solids and as a result tailing pond liquid inventory is lower.

In only one respect does operation of an acid leach mill result in a smaller environmental impact than a comparably sized carbonate leach plant. The carbonate plant has an approximately 40 percent higher thermal discharge output since the leaching process must be carried out at elevated temperatures, whereas the acid leach process is carried out at ambient temperatures. The additional incremental environmental impact is not considered significant.

On only two other features of the survey's model mill did the Committee have comments and in both instances the consequences are so small as to disregard them. The Committee pointed out that the model mill was located adjacent to a mine property. In instances where this is not the case, the temporary commitment of land to access roads, parking lots, and service buildings could be larger.

Also, in a specific mill study conducted for purposes of comparing its results with those of the AEC su-vey model, it was found that the amount of radiological liquid effluents in the form of uranium and daughters is approximately three times larger. However, since the numbers being compared are two versus six curies for the annual fuel require-

ment of the model LWR, neither is believed to have any significant impact on the environment.

The hearing's consideration of uranium milling and [408] disposition of the tailings it produces may provide an occasion for recalling the unfortunate incident which led between 1954 and mid-1966 to the use of uranium mill tailings as fill under and around an estimated 2,000 homes and other structures in the Grand Junction area. While no immediate or long-range health hazard has been proven — even those areas of fill shown to have "excessive" radon levels are appreciably below permissible mine radiation levels — extensive adverse publicity during the last two years is understood to have led to economic penalties to owners of the affected homes and at least temporary damage to the image of Grand Junction as a tourist and light industrial area.

Last October, the AEC and the State of Colorado signed a contract agreement which will permit up to $5 million in Federal funds authorized by the Congress and up to $1.25 million in state funds authorized by the Colorado Legislature to be spent on appropriate remedial steps — either removal of the tailings or the use of liquid styrene plastic sealant to block out the emanating radon gas.

The AEC survey addresses the problem, or at least the unlikelihood of a recurrence, in noting that where the Commission has control over licensing it will require mill operators in the future to provide assurance that funds will be available for reclamation of a tailings storage area when mill activities are terminated. The Commission will further require [409] the operator for a period of 50 years not to permit:

(1) exposure or release of the tailings material to the surrounding area;

(2) building structures on the covered surface which man or animals can occupy;

(3) subdividing the covered surface; or

(4) establishing private roads, trails, or rights-of-way across the covered surface.

Uranium Hexafluoride Production.

The AEC survey treatment of uranium hexafluoride production presents the first instance where the model plant selected, a 50:50 composite of two totally different processes, may lead to some difficulty in interpreting environmental impacts. As the survey, itself, points out:

> "The nature of the effluents from the two processes differs substantially; the hydrofluor method produces effluents primarily in the gaseous and solid state, and the wet solvent extraction method releases mostly liquid effluent."

It follows that the environmental effect of a plant built with either process could be significantly different than the average of the two processes.

Since the survey includes extensive descriptive material on both processes and since the AEC assumes in selecting the composite model that "roughly equal quantities of [410] UF_6 feed to the enrichment plants are produced by each method," one might weight the summary data in such a manner as to approximate the performance and hence the environmental impact of either type of plant.

Beyond this observation, we have two comments on the summary treatment of UF_6 production in the overview section of the survey, neither of which would be expected to grossly affect the values indicated.

There is a question as to whether a specific value should be shown for a specific thorium radionuclide, Th-230. It is our understanding that the thorium content, as well as the mix of thorium radionuclides differ markedly, depending on the source and age of the uranium concentrates received. The UF_6 producer can, of course, exercise no control over this; his task is simply to remove them udring the course of his operations in order to meet the chemical specifications of the UF_6 product.

We assume that the thermal effluent value in the summary was calculated from the quantity of natural gas consumed. In this connection, it might be noted that all electric energy consumed by a conversion plant will appear as thermal effluent discharge except for minor energy level differences between feed materials and the UF_6 product.

Uranium Enrichment.

Since all three existing uranium enrichment plants [411] are owned by the Commission and since only limited information has been put into the public domain on their classified operations, it would be difficult, if not inappropriate, to attempt to comment in detail on the AEC survey's treatment of this step in the fuel cycle.

Three brief observations may, however, be in order.

First, it would undoubtedly prove helpful to those companies now considering an involvement in uranium enrichment to have access to the environmental report or statement on which the numbers in the AEC survey report are based.

Second, if, as has been suggested, new enrichment facilities were to rely for their power needs on nuclear power stations, in contrast to coal-fired stations, the impact on the

environment from the release of gaseous effluents could be expected to be less than those shown in the survey.

Third, it might prove helpful to potential owner-operators of new enrichment facilities to have available to them a more extensive treatment of accident considerations than is contained in the current survey report.

Fuel Fabrication.

A poll of companies currently engaged in nuclear fuel fabrication indicates general concurrence with the AEC survey treatment of this step in the nuclear fuel cycle. This is not surprising since the nuclear industry, with the exception of the uranium mining and milling segment, has had a longer record [412] of involvement in fuel fabrication than in any other phase of the nuclear fuel cycle. For this reason, the amount of information available to the Commission on commercial fuel fabrication operations is extensive and this is reflected in the data presented and the conclusions drawn in the survey report.

On only one point did the fabricators offer a substantive comment. They thought it important to point out that the summary values on effluent releases in the overview section of the survey report are those derived from a material banace analysis of the model plant's operations and hence should not be considered as characteristic of any particular plant other than in an average reference sense. Although this point was made by the AEC staff in describing its model plant approach, several other industry representatives in other segments of the fuel cycle have made the same point with respect to summary data on their particular step of the fuel cycle and hence it would appear to bear repeating.

Reprocessing Irradiated Fuel.

The model reprocessing plant, like the UF_6 production plant model, may lead to some difficulties in assessing environmental impacts resulting from the reprocessing of irradiated reactor fuel. In this instance, the problem is more complex in that the model is a composite of three plants, rather than two.

Further complicating matters somewhat, one of the [413] three plants is still under construction, another is approaching operations, and the third has temporarily suspended operations for modification and expansion of its capacity. The three plants do, however, share some common features in that they all rely on mechanical means for removing the irradiated fuel from the cladding and all of them use adaptations of the Purex process for at least some portion of the separations carried out.

In reviewing the characteristics of the model plants normalized to the annual fuel requirements of the model 1,000 Mwe LWR, as described in the summary of environmental considerations, a number of comments have evolved which may call for some modifications although none are of such a magnitude as to change significantly the over-all environmental impact.

For example, a value of ten to describe the ratio concentrations of I-131 to I-129 in radiological effluents is more typical of fuel that has cooled or decayed for 180 days rather than the 150 days stated to be the basis of the calculations. Also contained in these numbers is the implication that the reprocessing facility should be able to recover in excess of 99.9 percent of the radioiodine contained in the fuel.

Laboratory experiments carried out under ideally controlled conditions have indicated that it should be possible

[414]
to achieve such recovery. However, there is no evidence that this degree of recovery has been demonstrated in a reprocessing plant where hundreds of pieces of equipment are involved and circuitous routes for discharge of volatile materials can and do develop.

We believe, under the circumstances, that it would be more realistic to assume that the concentrations of the two nuclides in the radiological effluent release can be held to the equivalent of one-thousandth of the permissible concentration limits in air specified in 10 CFR Part 20, the Commission's regulation on protection against exposure to radiation.

An additional comment on the radiological effluents reported is suggested by the unlikelihood that a liquid waste stream released as liquid or as steam vapor would contain only tritium and ruthenium-106. To represent the other radionuclides present it is suggested that 25 curies of gross fission products and two curies of transuranics should be added to the reported liquid effluents.

Still another comment is that it is unlikely that a reprocessing plant would generate steam from coal as postulated. The more likely fuel would be oil which suggests that the levels of NO_x effluent discharge should be increased somewhat and the levels of SO_x effluent discharge decreased.

A final comment relates to the waste management [415] section of the survey report, but is entered here because it deals with the operation of a reprocessing facility. The survey report states that the spent fuel from a model LWR processed annually in a fuel reprocessing plant produces approximately 1,000 gallons of radioactive liquid waste. Presumably, this amount of waste is equated to a 35 metric ton

batch of irradiated fuel which means that the 1,000 gallons of liquid waste would be equivalent on a unit basis to less than 30 gallons/MTU.

Because of solids buildup from the precipitation of fission products and the potential for localized corrosion if heat generating solids remain in contact with the walls of the liquid storage tank, dilutions called for would probably necessitate maintaining a ratio of 100 gallons/MTU and more likely 150 to 300 gallons/MTU. This means that the volume of high level liquid wastes to be handled would be five to ten times greater than has been indicated.

Radioactive Waste Management.

The AEC survey's treatment of radioactive waste management appears to be an adequate discussion of the manner in which low-level wastes are now handled and the amnner in which high-level wastes are to be handled in the future. The discussion, we believe, also portrays an accurate assessment of the minimal potential impact on the environment that these operations anticipate.

[416]

In view, however, of the adverse publicity and controversy that this subject has provoked during the past year, we find it unfortunate that the survey's treatment is not less apolegetic and not more positive in tone. We do not question that some of the concerns expressed in the past have been sincere and perhaps even justified to the extent that straightforward and convincing answers could not be, or were not, always available in response to pertinent questions raised.

We believe, however, that those concerns were predominantly, if not exclusively, directed at AEC's proposed approaches to ultimate disposal of high-level wastes, not to the long-term management of those wastes.

[417]

I make a very definite distinction between the two techniques, and that was discussed this morning.

There is nothing in AEC's extensive experience in handling some 90 million gallons of high-level liquid wastes or in industry's more limited experience in handling some 600 thousand gallons of high-level liquid wastes that suggests there has been or is likely to be, any adverse impact on the environment. Nor is there any reason to believe that AEC's plan to store such wastes in the future in solid form in cooled and shielded near-surface engineered storage facilities for up to 100 years does not provide a more practical solution.

The AEC has indicated that all necessary technology is available for constructing the facilities; for removing the heat generated by the wastes; for monitoring and surveillance of the facility, the coolant and waste canisters; and for maintaining or repairing failed or deteriorating facilities, equipment and canisters.

As the AEC has further pointed out, what needs to be done now is to select a site, to choose the particular engineering approach which offers the most practical and efficient solution to specific design and engineering problems and to construct the facility.

If the industry has any criticism of the AEC approach, it is not with the validity of the concept or with **[418]** AEC's ability to develop and carry it out, but rather with its apparent lack of appreciation of the need for early determinations that will bear on long-lead time actions of the industry.

As early as mid-1969, the AEC informed the industry of its intent to require all high-level wastes generated in reactor fuel reprocessing operations to be converted within

a five-year period to an AEC-approved solid form and to be transferred within a 10-year period to a federal repository, the location of which would be designated at a later time.

As of this date, almost four years later, the Commission has still not indicated what form of solid waste it will accept, where the federal repository is to be located, or what charge will be assessed to defray the costs of storage and surveillance.

Even though the AEC does not intend to seek Congressional authorization for initial funding of the engineered facility prior to the FY 1975 budget submission and does not expect to receive the initial shipments of such solid wastes until the early 1980s, it needs at an early date to come up with answers to the questions suggested above so that the industry can handle its responsibilities under the plan in an orderly fashion.

Transportation.

Conclusions drawn from the transportation section **[419]** of the AEC survey report appear to be valid and, indeed, consistent with other sections of the report in that estimates of environmental impact are conservative, i.e., larger than experience suggests they are likely to be.

On the other hand, we are not sure that the treatment is sufficiently definitive to lead some readers of the report, particularly those not familiar with the physical, chemical and radiological properties of the various materials transported between successive stations of the nuclear fuel cycle nor with the manner in which these materials are packaged and shipped to understand or appreciate the bases for the conclusions reached.

It is for this reason that we believe the value of the report would be enhanced if the survey treatment were amplified. We would include:

(1) A brief description, with accompanying illustrations, of the various types of containers used to transport various materials. Included in such descriptions should be sufficient reference to the contents to permit the reader to understand the nature of the hazards and consequences in terms of environmental impact if an incident or accident were to occur in the handling or transport of the container. For example, in the shipment of fuel materials up to the enrichment stage any problems encountered would arise not from the radiological properties of the materials, but rather **[420]**
from their chemical properties. This type of shipment is not unlike the shipment of most bulk solid chemicals.

(2) Additional information on why the consequences of an accident would be expected to be negligible, including, for example,(a) that packages are required to be designed to withstand severe accident conditions with no loss of confinement or other essential package function, (b) that the probability of a package being involved in an accident of the degree of severity assumed in setting design requirements is far less than the probability of the package being involved in an accident, and (c) that the testing program on which shipping container specifications are based involve such conditions as a 30-foot freefall onto a flat unyielding surface, a fire in which the package is subjected to a temperature of 1475 degrees F for 30 minutes, and complete immersion in water.

(3) Expansion of the summary table in the overview section of the report to indicate the normal radiological effects of the various transportation steps shown. Such

an expansion, we believe, would provide a basis for comparing the resultant levels of potential radiation exposure with those in other steps in the fuel cycle and thereby demonstrate the very low environmental impact associated with the transportation segment of the nuclear fuel cycle.

Other Issues.

[421]

We believe, as is pointed out below, that attention should be given to the following issues which have been intentionally omitted from the survey:

Plutonium Recycle.

Reference has been made to this in the testimony yesterday.

The AEC survey report points out that plutonium recycle in the present generation of LWR power reactors will be considered in future documents. Subsequently, the report refers to the fact that the feasibility of using plutonium in a mixed plutonium-uranium oxide fuel for LWRs has been demonstrated, that the timing and extent of its future use is an economic matter to be considered by each utility, and that between now and 1975 or 1977 limited means for storing the recovered plutonium product inventory will be provided at the three nuclear fuel reprocessing plants.

Although we concur with this assessment of the situation, we wish to make three observations, each of which suggests that steps should be immediately taken by both the industry and the AEC on the technical and licensing fronts to assure routine plutonium recycle at the earliest possible date.

At the present time, there is in existence only enough storage capacity to accommodate some 2500 kilograms of plutonium, either as the nitrate or oxide. Although [422]

reprocessing plant operators will undoubtedly install additional storage facilities, the high capital costs of these facilities and the difficulties involved in the storage of plutonium, particularly in the nitrate form, both provide incentives for keeping the amount of stored plutonium to a minimum.

The direct relationship between the availability of plutonium for recycle and the requirement for additional uranium enrichment capacity provides a further incentive to recycle plutonium in light water reactors. Between now and the end of 1981, by which date the cumulative demand for enrichment services is expected to have equalled cumulative supplies, including pre-produced inventory, it will be necessary to have recycled 100 per cent of the plutonium that will have been generated; otherwise, our enrichment capabilities will have been exceeded by some 15-20 percent.

Finally, the argument can be advanced that the best way of minimizing the health and safety problems, the accountability and safeguards problems, and the shipping problems associated with plutonium is to assure its recycle in the minimum turnaround time possible.

Reference was made yesterday to the AEC plans to develop data for inclusion or generic treatment of the HTGR fuel cycle. We endorse the AEC's approach to the problem. As I say, sufficient data should be available soon, if it is

[423]

not already available, to permit consideration of the uranium-thorium fuel cycle used in the high temperature gas-cooled reactor. We believe the proposed rule change and supporting survey report could be couched in sufficiently general terms so as to include this fuel cycle without compromising the environmental assessments already developed. If this proved not to be the case, we would recom-

mend that the AEC Staff initiate at an early date the preparation of an appropriate addendum to the survey report.

The LMFBR Fuel Cycle.

The fuel cycle to be employed in the liquid metal fast breeder reactor is, we agree, too far removed in time from commercial reality to incorporate an assessment of its environmental impact in the present survey. Nonetheless, we believe that a mechanism should be established for amending the survey analysis when sufficient data becomes available to warrant such action.

Transportation To and From the Reactor.

Also excluded from the survey report is the transportation of fuel materials to and from the reactor, that is, the transportation of cold fuel to the reactor and irradiated fuel from the reactor to a fuel reprocessing plant and the transportation of low-level wastes and high-level solid wastes from the reactor to depositories. These transportation operations are excluded since the proposed rule **[424]** amendment would require them to be covered in the Applicant's environmental report and the Commission's detailed statement relating to individual licensing proceedings.

We do not see why these steps in the fuel cycle cannot be treated in generic fashion as is proposed for the other steps. There are no characteristics of cold fuel that we know of that warrant special transportation considerations. The shipment of irradiated fuel from a reactor to a reprocessing plant would appear to involve basically the same considerations as the transportation of high-level solid wastes from a reprocessing plant to a federal repository. And finally, the transportation considerations involved in the shipment of low- and high-level wastes would appear to be the same, irrespective of their origin or destination.

Since the survey shows that the effect of the fuel cycle on the licensing of power reactors is sufficiently minimal to suggest that it may need not be considered and since the survey shows the environmental impact of transportation to be comparatively less than in some other steps of the fuel cycle, we fail to see the justification for not treating all phases of transportation in a generic manner.

It is now our understanding AEC has prepared reports similar to the ones we are discussing here, and it is my understanding they do plan rulemaking hearings on this.

To sum up, we think it is a creditable, **[425]** important and useful compilation whose conclusions are essentially valid. It should prove of assistance to this Board and to the Commission in the further consideration of whether and in what manner the environmental effects of the uranium fuel cycle should be considered in individual light water power reactor licensing cases.

We also believe the creditability of those would be enhanced by placing some upper and lower limits on the operating results of some of those facilities.

Its usefulness would be enhanced if it were modified and amplified to include other steps in the light water reactor fuel cycle and the fuel cycles employed in other types of reactors.

If that is to be treated in a separate document in a timely fashion, that would certainly be a workable and appropriate mechanism.

Third, we feel the report should be limited to the purpose for which it is designed, that is, for assessing the environmental impact of the nuclear fuel cycle in the licensing of power reactors. It is not and should not be considered an

applicable or appropriate guide for the licensing of specific fuel cycle facilities.

In light of these comments and those submitted by others, we believe there is merit to considering the current edition of the survey report as a draft. At such time as **[426]** the draft is modified to include necessary additional information, perhaps further technical editing should permit the elimination of extraneous detail in areas of minimal significance and the inclusion of additional detail in areas of greater significance.

I would ask Mr. Gleason to take up the subject of alternative rules at this time.

MR. GLEASON: Would the Board desire to question on the technical aspects of our statement before I proceed?

CHAIRMAN PAGLIN: Let me consult.
[427]

CHAIRMAN PAGLIN: The Board would prefer the entire presentation be finished, and then go back to the technical questions, if there are any, Mr. Gleason.

MR. GLEASON: Thank you, Mr. Chairman. As the Board knows, the Commission has two alternative rules before it which we are issued in the Federal Registry, Notice for consideration, as to how the fuel cycle might be taken into account in the individual reactor-licensing proceedings.

Alternative One has been clarified by the Staff as the Board is aware of, and I won't go into the background of that. My understanding of Alternative One, as clarified, is that it is a codification of the Appeal Board's ruling in the Vermont Yankee Case, at least, in practical result, if not necessarily, in legal theory.

Alternative Two, on the other hand, provides for some consideration of the generic aspects of the fuel sycle in the individual reactor-licensing proceeding. This would be done on the basis of Table S-3, from the Survey, which is the summary section, and which Mr. Smiley has pointed out, does contain quantification of the environmental impacts.

The National Environmental Policy Act, its council on environmental quality guidelines, and the AEC rules in Appendis D to Part 50, all make it clear that cost-benefit analysis in the individual proceedings should contain a full, and frank disclosure of the costs and benefits of the proposed **[428]** action.

The reason we are here, today, is because there is some question, as was noted in the Commission's notice, as to how this principle should be applied in actual practice. It is not entirely clear.

And, in fact, as the Board knows from reviewing the filings that have already been made, there is a substantial difference of opinion among those who have looked at the rules as to which is the preferrable approach.

The split is not only among the lawyers, but is reflected, I think, as well in some of the technical comments that have been submitted. So, we think that the Board does have a difficult task in sorting out what is relevant with respect to each of the rules, and which is to be preferred by the Commission.

One group which is represented here by Mr. Upton has argued in favor of Alternative One, noting that the Survey indicates the insignificance of the fuel cycle impact with respect to an individual reactor. They also cite that in RDC Report for the proposition that the impacts, here, are remote and speculative, and not readily ascertainable.

As further reasons why the impact should not be considered in the cost-benefit analysis in individual proceed-proceedings.

Another group represented by Mr. Freeman, who you [429]
will hear from this morning, is in favor of a modification of Alternative Two, and their rationale is essentially that Calvert Cliffs, Appendix D, and so on, does require some consideration of these things, that we have a survey which has, to some extent, quantified those impact, and it is consistent with Appendix D, and with NEPA to consider this, generally along the lines which would be accomplished in Alternative Two.

The Atomic Industrial Forum has a Lawyers Committee within that Committee on regulatory procedures, and we have given some attention to both of these alternatives, and to some of the other alternatives, as well, which have been mentioned, and we were unable to reach a consensus in favor of one or the other.

For that reason, we are not, today, in a position to state a preference with respect to Alternative One, or Alternative Two, and I might add that anything we say here, with respect to those alternatives, because our lawyer's group has not taken a position, would necessarily represent my own individual views with respect to the alternatives.

We think our inability to reach a consensus does indicate the burden this Board has, and which the Commission has, in developing the kind of rationale that would be necessary to support either of the alternatives.

Indeed, it is not entirely clear and we think, the [430] primary purpose of this hearing should be to provide an adequate record for the Commission to make those determi-

nations. While not taking a position, we would like to address to the attention of the Board, a couple of fundamental issues, we think ought to be considered.

First, of course, and this has been raised by Mr. Roisman, and others, is the Congressional question of whether each of the alternatives at least met the minimum requirements of NEPA, and the guidelines in Appendix D.

Second, and I think, this is a particularly important one, that I have not heard a great deal said about in this proceeding, so far, is the practical effect that each of the alternatives will have in the individual reactor-licensing proceedings.

In other words, if the Commission were to adopt Alternative Two, as a practical matter, what would the parties in the individual proceedings be required to do? And the same, with respect to Alternative One.

The final question is the impact which adoption of any rule, whether Alternative One or Two, or some other rule, would have on the cases currently in the licensing-process. The Commission notes in its notice, the continuing validity of the various proceedings.

Yesterday, the Appeal Board ruled in the Shoreham Proceeding, that the Vermont Yankee would indeed continue to [431] govern until a ruling is issued.

Mr. Freeman mentioned that ruling. But, I would like to point out a footnote to the Appeal Board Ruling, that goes to this point, Footnote 19, where the Appeal Board, in ruling on the questions that we are certified, states that, "Any rule which the Commission may adopt as a result of the current rule-making proceeding, may be made applicable as appropriate to this proceeding."

And, they cite various sections of the Atomic Energy Act, and also their own ruling in the Point Beach 2 Proceeding. So, we think it is very important and it is not in the rule now for this Board, and the Commission to focus on what provisions should be made for applying the rule which is finally adopted to the individual proceedings.

There have been a couple of points that have come up so far, that I would like to take a few minutes to respond to. Particularly as to Mr. Roisman's theory of this rule-making proceeding. As I understand it, what Mr. Roisman is asking for, is a generic proceeding on the entire fuel cycle.

And he defines, my understanding of his definition of generic is that it would be a total review of the entire atomic energy program, both with respect to the fuel cycle, and the construction and operation of the reactors, themselves.

I would like to note that having sat through yesterday's testimony, that, if indeed, this were an adjudicatory **[432]** type of proceeding, as Mr. Roisman would like to have, that most of the testimony would have been outside of the scope of the proceeding, since it did not relate, either to the substance of the alternative rules, or to the substance of the survey, itself.

The notice of the Commission is very clear, with respect to the scope of the proceeding, and had this been an adjudicatory-type proceeding, I am sure that much of the testimony offered, yesterday, would not have been permitted on the grounds that it would be outside of the scope of the proceeding.

I don't mean to suggest that we are objecting to Mr. Roisman and his technical experts taking the opportunities, which they have here to explore those broad issues.

We think that is perfectly consistent with the approach that the Commission has taken here, in establishing this rule-making proceeding. We think they ought to have an opportunity to raise all of the issues, which they think are relevant to this issue, and we think that the primary purpose of this proceeding is to establish that kind of a broad record which will aid the Commission.

So, I don't mean to suggest we are objecting to that. But, it does indicate that the Commission's approach, here, i.e., a rule-making proceeding, does have a great deal of merit. And it avoids all of the cumbersome, long, drawn-out **[433]** procedures, which would stand in the way in an inquiry such as this, of establishing a full and adequate record.
[434]

I would also like to note, since it sort of goes to the heart of Mr. Roisman's group's position, you will recall that Mr. Roisman said yesterday if the public had the facts, they would not permit the atomic energy program to go any further. He was speaking as a lawyer, I take it, since that is his professional position, but his technical expert, Dr. Radford, disagreed with him on the fundamental issue.

I wish to call that to the Board's attention, as to the need for the continuation of the nuclear fission program. Dr. Radford did indicate in his opening remarks that in their house they do not require unanimity of views on this subject, and he disagreed and he did think it was necessary to continue a nuclear fission program.

I would also like to note that Dr. Radford, in commenting on the Part 50 as-low-as-practicable proceeding, indicated that he thought the Commission went too far and imposed overly conservative criteria in that proceeding.

Now, his reason, I guess, was that they are so low they are not enforceable. Nevertheless, it is a recognition of the approach which the Commission has taken with respect to safety and environmental considerations, and truly a very conservative approach, and this was recognized by Dr. Radford in his testimony.

We see a little bit of this same philosophy **[435]** on environmental impact. My reading of NEPA and all of the relevant guidelines indicates that the responsibility of the government agency is to make a realistic assessment of environmental impact. Now what do we see developing, if you take the survey, you take the rulings of the Commission in individual proceedings, look at the detailed statements in those proceedings, you will see the Commission is indeed adapting their conservative approach with respect to safety issues to environmental issues.

I think that results in a much more conservative, more strict assessment of environmental impact than is required in NEPA. I just point that out because I think it does go to a determination of the seriousness with which the Commission is approaching its responsibilities in this area.

Mr. Roisman made another point which I think is worth commenting on. He said that the industry — he referred to the comments of Babcock and Wilcox, thinks that the material in the guide is conservative; nevertheless, they don't want it applied as operating standards, and that is true. I think that we have tried to make that clear in Mr. Wiggins' statement.

The survey is intended as an assessment of the generic impact of the fuel cycle. It has a model approach in there which results in facilities which cannot be designed, **[436]**

and which cannot be operated, but which result in very conservative estimates of environmental impact. It ought to be very clear, there should be no confusion in the Board's mind about our position on that. We would be concerned if anything in the survey would be construed as operating limitations, because that is not the purpose for which the survey was designed.

So we think Mr. Roisman has made a valid point here, and we think there is a valid reason for not considering these as operating limitations.

Now to get to what I understand is the heart of Mr. Roisman's position, which is that the Commission has made an error in adopting the rulemaking approach here, and that they should go to the adjudicatory approach with the full rights of cross-examination and discovery. Leaving aside whether or not this would be legally barred by NEPA, and I don't think it is, but let's leave the legal issue aside and look at the policy issue involved here, and I know from the discussion by the Board that they are well aware that the underlying policy considerations are broad.

If Mr. Roisman thinks he needs an opportunity for cross-examination and discovery, we think that he has a burden which he has not yet discharged in this proceeding, which is to demonstrate that information which he considers to be relevant and documents he considers to be relevant are **[437]** not available to him. I have heard nothing so far, and seen nothing in his written submissions so far which would indicate that Mr. Roisman has asked questions which will not be answered, or has asked for information which will not be provided.

Now we think the Commission has taken a reasonable approach in this rulemaking proceeding. We think they have

given this Board a great deal of flexibility with respect to the procedures, for the sole purpose of assuring that procedural arguments are not going to stand in the way of developing a full and adequate record. And we would hope on the basis of these two days of public hearing that whatever questions the Board may have, and whatever questions Mr. Roisman may have, will be asked, and each of the participants in this proceeding will make a serious effort to answer them.

Now if those questions are not asked, then we question whether or not Mr. Roisman has fulfilled his threshhold responsibility, which is to exhaust his remedies in this proceeding before he says that this is not an adequate way of assessing the environmental impact of the fuel cycle.

What is required here is not procedural due process, it is substantive due process. What is required is the compilation of an adequate record upon which the Commission can make a determination and then some indication on the part of the Commission that they have evaluated that **[438]** record. And we feel that if this Board discharges its function in compiling that record and if the Commission discharges its function in evaluating that record, that the results of this proceeding will be valid with respect to NEPA and will be upheld in the courts.

So we think that there is a very heavy burden on Mr. Roisman's group to demonstrate that this approach is not effective.

Finally, again to get back to the generic approach, Dr. Steindler, I believe, raised the question of whether these broad issues of national policy, in other words, the total atomic energy program, should be more appropriately considered in Congress or some other body — excuse me, the

Chairman asked this question — rather than before this Board.

Well, the Congress has looked at the atomic energy program at least twice in a very comprehensive fashion, when they enacted the Atomic Energy Act of 1946, and when it was revised and re-enacted in 1954. There is a public policy decision involved in those acts which is valid today, that indeed there is a national policy in favor of the atomic energy program. Congress looks at this again every year, in both the authorization and the appropriation proceedings.

So we think with respect to the overall atomic energy program, that this is not the proper forum for consideration of that broad public policy issue. We think **[439]** that has already been laid to rest by the Congress.

And we think that Mr. Roisman's interpretation of this to include both the reactor and the fuel cycle does not comport with what appears to be the intention of the Commission in what I think is a very clear statement in their Notice of Proposed Rulemaking.

Mr. Roisman raised a question about the interpretation of Alternative 2, which I must say I had not focused on before. His question was whether the words "shall be" in Alternative 2 indicates that the survey would be placed in the Staff's detailed statement and therefore be subject to cross-examination in the individual hearings.

It seems to be very clear to me what the Commission's intention is in Alternative 2, and it is not that, particularly when you read it in view of the Commission's rule of practice in Section 2.758. Section 2.758 says that a Commission rule which is validly adopted is not subject to attack in an individual proceeding.

In other words, you can't go behind the rule in an individual proceeding. The remedy is in a petition for rule-making.

Now when you apply Section 2.758 to either Alternative 1 or Alternative 2, I think it is clear that it is not contemplated that there could be an attack in the individual proceeding on the validity of the rule or on the **[440]** validity of the survey which is a part of that rule.

Therefore, to get back to one of the questions I raised before, I think it is very important for this Board to focus on the precise impact which adoption of either of these alternatives would have in individual proceedings.

Mr. Chairman, I think that concludes the remarks we would like to make.

We would be happy to answer any questions the Board may have.

(The document follows.)

Discussion of Alternative Rules

The Commission has proposed two alternative rules for considering the nuclear fuel cycle in individual reactor licensing proceedings. Alternative (1), as published in the Federal Register, provides that with certain exceptions the environmental impact of the nuclear fuel cycle need not be included in the applicant's evironmental report or the Commission's detailed statement, "since the environmental effects of those activities as related to a particular light water-cooled nuclear power reactor have been analyzed (in the survey) and, *when* factored into the cost benefit analysis *are* sufficiently small as not to affect significantly the resultant conclusion". In response to the Forum's letter inquiry

of January 9 the AEC has stated that the word "if" should be substituted for "when" and "would be" for "are".

This clarification of the Commission's interpretation of alternative (1) is one of substance. Under the original wording, it appeared that in individual reactor licensing proceedings, the environmental impact of the nuclear fuel cycle would have been considered by the Commission in the overall cost-benefit analysis, even though not included as such in the environmental report and detailed statement. As modified, it is clear that the environmental impact of the fuel cycle will not be considered at all in individual reactor licensing proceedings, since it has already been considered in the survey and been found to be *de minimus*.

Alternative (2) provides that the environmental impact of the nuclear fuel cycle will be considered in the environmental report and detailed statement in individual reactor licensing proceedings on the basis of Table S-3 of the summary. Thus this alternative does provide for some consideration in individual reactor licensing proceedings of the environmental impact of the nuclear fuel cycle, *albeit* on a generic basis.

The National Environmental Policy Act, the Council on Environmental Quality guidelines and the AEC's rules in Appendix D, 10 CFR Part 50, all make it clear that cost-benefit analysis should contain a full and frank disclosure and consideration of the costs and benefits of the proposed action; however, as the Commission noted in the statement of considerations accompanying the proposed alternative rules, "The results of the application of this principle to the question of inclusion of environmental effects associated with the fuel cycle are not entirely clear." In fact, there is a wide division of opinion among those who have studied the alternatives as to which is to be preferred.

One group,* arguing in favor of alternative (1), states that this approach is consistent with NEPA and would simplify and reduce the scope of reactor licensing proceedings. Stating that alternative (1) as now proposed is "grounded on a conclusion of insignificance", the group makes certain suggestions for additional grounds of support for alternative (1); if so revised, the group would then invoke *NRDC* v. *Morton* as providing the legal rationale:

> "Obviously, the Commission does have authority to set limits to the scope of its environmental review. For example, as stated in *National Resources Defense Council* v. *Morton* (458 F.2d 827, 3 ERC 1558 D.C. Cir. 1972), only 'reasonable alternative courses of action' need be examined. The logic of the language in that decision applies equally to this rulemaking proceeding if the Commission finds that there are effects which 'cannot be readily ascertained' and which involve only 'remote and speculative possibilities.'"

Another group,** supporting, with some slight modifications, alternative (2) contends that "this alternative affords the greatest clearance over the high hurdles of the original *Calvert Cliffs* decision". The group also contends that alternative (2) is more consistent with the stress on systematic analysis and the encouragement of quantification found in *Calvert Cliffs* and Appendix D which requires that environmental reports and detailed statements include:

> "a cost-benefit analysis which considers and balances the (adverse) environmental effects of the facility . . . as well as the environmental, economic, technical and other benefits of the facility. *The cost-benefit analysis shall, to the fullest extent practicable, quantify the various factors considered.*"

*Statement filed on January 15, 1973 by LeBoeuf, Lamb, Leiby and MacRae on behalf of eight utilities.

**Statement by Hunton, Williams, Gay and Gibson, filed on January 15, 1973 on behalf of fourteen utilities.

The Regulatory Procedures Subcommittee of the Forum's Lawyres Committee studied both alternative rules but was unable to reach a consensus in favor of one or the other. For this reason, we are not here expressing any preference between the two alternatives, but would like to reserve the right to do so at a later date after the record has further developed the arguments on each side. We should also like to note that our inability to take a position at this time, along with the persuasive arguments which have already been developed on both sides, confirm the Commission's statement that the appropriate answer is, indeed, "not entirely clear" and places a heavy burden on this Board and the Commission to assure that the record is fully developed before a position is finally determined.

While not taking a position, we would like to raise a few questions for the Board's consideration. The first is the threshold question of whether both alternatives meet at least the minimum requirements of NEPA, the Council on Environmental Quality Guidelines and Appendix D. A second is the practical effect which each of the alternatives would have in individual reactor licensing proceedings, i.e., the burdens imposed on the parties by application of either alternative. The final question is the impact which the adoption of any rule would have on cases currently in the licensing process. We believe the Board and the Commission should seek further guidance on these issues before a determination is made in favor of either alternative.

In summary, we believe the Commission has a difficult task in choosing between these alternative rules and hope that this statement is of some help in its deliberations.

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In the Matter of	Docket No. 50-3
Environmental Effects of the Nuclear Fuel Cycle	

Certificate of Service

I hereby certify that copies of the statement of Edwin A. Wiggin, Executive Vice President of the Atomic Industrial Forum in the above-captioned proceeding, were served upon the attached list of individuals this 30th day of January, 1973.

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CHAIRMAN PAGLIN: Thank you, Mr. Gleason and Mr. Wiggin.

Dr. Steindler.

DR. STEINDLER: I gather that the Forum endorses the generic approach. Other than potential convenience, why do you favor it?

MR. GLEASON: Dr. Steindler, the Forum, through its environmental committee has done a great deal of work on AEC's environmental reporting requirements, and as you know, a draft guide has been out for a number of months and a final guide will be coming out in the near future.

Our work on that guide has made us realize that there are a number of aspects of the environmental impact which indeed are common to many facilities. And to try to take a subject which is generic and to consider it in the context of an individual reactor proceeding, it simply does not make sense.

We think that we are in a new area of environmental reporting here, we think we are sort of in the model, the stage of the development of the state of the art, and we think the

generic issues ought to be sorted out and considered on a generic basis.

It is more than a question of convenience, it is a question of the best way to evaluate impacts which are generic and you can't do that as adequately in the context **[442]** of an individual proceeding as you can in a broader generic type proceeding.

[443]

DR. STEINDLER: There was a comment on uranium mining, and I am reading from the text that I have, you say, "We question whether any land is permanently committed," and then you discuss land reclamation processes, and whatnot.

Do you propose then, a rather more restrictive definition of permanent commitment which, in effect, says, that unless you have got very long-lived fission products you are burying someplace, there is no such thing as permanent commitment?

And, then to put a second question to you, if that is your intent, are you recommending that that part of the document which speaks of permanent commitment, not only in mining, but in the analysis of other facilities, ought to be revalidated?

MR. WIGGIN: I think the definition you cited is a fair one. It seems to go along the trend followed, being followed at the State and Federal level in legislation; and, indeed, if it is going to be returned to its natural state, at such time as the activity, whatever it may be is terminated, then I guess I think it has not been permanently committed.

DR. STEINDLER: I don't want to get involved in the same discussion I got into, earlier, about the philosophical

concepts of permanence, and I appreciate Mr. Murray's concern about coming to grips with the real issues rather than philosophy.
[444]

But it does make, obviously, a difference to the magnitude of the impact if you assign a certain number of acres of territory or something to be permanently out of bounds for society's use? Now, you can break up concrete, and bury it, if concrete is the only thing you have there.

You have a little more problem if the concrete is contaminated with long-lived, fission products. But, is it then your position that any facility, that you can, in effect, disassemble or move or dispose of, in some fashion, short of being contaminated with long-lived activity, it represents, perhaps, an interim commitment of resources or land, but not a permanent commitment of resources or land.

Is that your position?

MR. WIGGIN: Yes, sir.

MR. MURRAY: Dr. Steindler, I think you misread me a little bit, I don't want the record to reflect that, if I may. I think these are exceedingly important philosophical issues we are dealing with here, and they ought to be dealt with, and dealt with very carefully.

What I was suggesting, was the adjudicatory process is not the proper process to deal with philosophical issues, but, rather, the rule-making process. The adjudicatory process is for getting at facts, and we have not had any factual disputes presented.

DR. STEINDLER: I see. I am sorry for the **[445]** misinterpretation. In your testimony, you brought up, as you say, the whole question of mine tailings, and their use.

I wonder if we can identify or you can identify, for us, who, at the time the mine tailings were, in fact, used, in the Grand Junction area; who had jurisdiction over the licensing?

Are we talking about something that the Commission, as then constituted had jurisdiction over, or was this outside of the Commission's licensing activity?

MR. WIGGIN: It is my understanding we got into the problem because nobody had jurisdiction. or nobody exercised authority. The AEC did not have that responsibility, and apparently, the state, in this instance, did not exercise any responsibility or authority.

DR. STEINDLER: Is it possible to move from this witness to the Staff witness?

CHAIRMAN PAGLIN: Surely.

DR. STEINDLER: Mr. Smiley, could you comment on that?

MR. SMILEY: I think Ed is largely correct. The responsibility was not the AEC's. It, technically, was the state's. The Act says that any material that contains less than five hundredths of a percent uranium is not under the jurisdiction of the AEC.

I might point out that stuff like fertilizer is .01 or .02 of a percent. That is one of the reasons I am **[446]** sure they went into that. So the fact of the matter is AEC had no jurisdiction. There is a letter by Harold Price in this regard in 1961.

DR. STEINDLER: Then, I can assume, bringing up that particular issue does not have a direct bearing on our problem of the environmental impact as treated by the Division of Licensing?

MR. WIGGIN: That is a correct assumption. I raised it simply because I thought it would be raised by others and indeed, it was.

DR. STEINDLER: Yes, in the area of hexafluoride production, you indicated there is a problem of averaging-out two very different plants, and you then, in the second paragraph of that particular topic, I think, are making a suggestion of an averaging process, but I fail to see quite what it is that you are suggesting.

Let me couch the question in this way: Are you suggesting that, in order to revise or make more accurate, the survey documents, that an analysis be done of the two processes that are involved, and impact definition be defined for both of those processes, appropriately summed, and then averaged?

MR. WIGGIN: No, sir. I did indicate, and I do believe the credibility of the model approach — not only in this instance, but across the board — would be enhanced if indeed, there were some real measurements of the upper and **[447]** lower limits to show where in its numbers generated in the model, fit.

In this particular instance, what I am trying to say is, if you know which plant was used to produce a given amount of uranium hexafluoride, by deifnition, you know the kinds of effluent released, and therefore, you can go to the survey report, and presumably assume that all of the effluent of that particular type, whether it be solid or whether it be liquid, came from that particular plant.

In other words, I think there is a way of backing into the environmental impact of each type of plant, because they are so different, and because the AEC has assumed that 50 percent of the product will be produced in each.

DR. STEINDLER: As you relate this then, to a particular reactor, in order to keep track of the "Blue" UF-6, that has been produced in the Blue Plant —

MR. WIGGIN: I am not suggesting that.

DR. STEINDLER: Are not you going to require the defusion process not mix the uranium coming from this particular plant, and then that enriched uranium be identified as attributed to a particular reactor?

MR. WIGGIN: no, I am not suggesting that. The intents of the paragraph was a search on my part to provide a backdoor approach to credibility of the model result.

DR. STEINDLER: You indicated, and I think, quite **[448]**
correctly, that the quantity of high level liquid waste should be escalated above what is in the report. But, if my memory serves me right, liquid, high-level wastes stored for an interim period do not represent, since they have to be consequently treated, and converted to solids, which are consequently shipped to the repository, do not represent a prolonged environmental impact, that is, a prolonged environmental concern.

I presume that your comments on the volume of high-level waste is simply a matter of keeping the factual aspects of the report in order?

MR. WIGGIN: Yes, sir, you are absolutely right.

DR. STEINDLER: I believe that is all I have.

CHAIRMAN PAGLIN: Dr. Geyer?

DR. GEYER: Mr. Wiggin, on page eleven, under the plutonium recycle, the last paragraph makes the suggestion that the health and safety problems would be mini-

mized by recycling plutonium to theextent practicable, or reducing the turnaround time to the minimum possible.

Perhaps, not now, but consequently, could data be given on what you believe to be the minimum turnaround time, how much this would reduce the inventories that might need to be otherwise held, what the problems would be associated with taking this suggestion?

MR. WIGGIN: You are quite right. I cannot answer that. I would be very happy to submit a written answer to it, [449] or attempt to.

DR. GEYER: On page 13, the paragraph at the top of the page discusses some things that yon feel need to be done with respect to the survey report.

Could you amplify, not now, but in future communications, could you amplify in detail, what you think needs to be done?

MR. WIGGIN: Yes, sir.

DR. GEYER: My last question is to Mr. Gleason and I don't know whether I am the proper person to ask this question or not, but on the last page of the testimony, page 15, several questions are asked which Mr. Gleason partly answered, but also backed off from answering them, because he was at that time, representing the Atomic Industrial Forum.

Since he is a lawyer, and an individual, can I ask Mr. Gleason, what his answer is as a person to these three questions would be.

The first one: Do both alternatives meet the minimum requirements of NEPA on environmental, quality guidelines, and Appendix D?

MR. GLEASON: Dr. Geyer, I was afraid you were going to ask that.

CHAIRMAN PAGLIN: If he didn't I think either Dr. Steindler or I would have.

MR. GLEASON: You have presented a very tempting [450]
proposition to me, obviously, because as a lawyer, and an individual, I do have some views with respect to the answers to those questions.

However, I cannot completely disassociate myself from my position as the Staff counsel of the Atomic Industrial forum, and also my position as the Secretary of the Lawyers Committee.

And, I think that it would not be appropriate for me to indicate what my personal views are; first of all. Secondly, these are fairly serious issues, and we have looked at them in this lawyer's group. We have not really solved what our position is on all of them. We anticipate that there are going to be further discussions and considerations of these issues.

I would hope, before the record in this proceeding is closed, that either through the Forum, or through the submission of individual parties in this proceeding, that the answers to those questions will be a great deal clearer than they are today.

So, we would undertake to provide you with additional guidance on this subject.

DR. GEYER: That would be adequate, I believe.

CHAIRMAN PAGLIN: And, would you, Mr. Gleason, if I may interrupt, direct that guidance in the areas of what you think would be the practical effect — you referred to the, [451] "practical effect of the adoption of either Alternative One or Two," and likewise, so long as we are throwing darts at you, you made reference in your comments to

the question of the commission's rules and the impermissibility of attacking the validity of a rule in an individual licensing case, and that is a general purpose of administrative law.

How would you suggest, for example, the most practical and effective way for the participant to question the validity of the data, the matter to which I referred in my discussion with Mr. Roisman, what do you feel would be the most practical and efficient way of having questions raised as to the validity of the data in the survey.

Because, if I believe what you say is true, and what he says is true, this would be the Forum where that would be done.

It that correct?

[452]

MR. GLEASON: That is right. I think Section 2.458 contemplates that someone objecting to a rule does not have a forum, but what it does is indicate the appropriate forum is a petition for rule-making, in accordance with, I believe, 2.802, and that the rationale for that is that the rules of general applicability have a broader impact than can be adequately assessed by the parties in an individual proceeding, and therefore, if the validity of a general rule is going to be attacked, it ought to be attacked in a forum, where all interested parties have an equal opportunity to participate and that would be in a rule-making proceeding.

CHAIRMAN PAGLIN: Right. But I am slicing that a little thinner, looking for an effective procedure by which in the rule-making proceeding the parties could raise questions as to the validity of facts.

As I indicated to Mr. Roisman, I personally do not feel that the labels are so holy — and I think the courts feel the

same way about it, they have indicated that a rose by any other name, that whether you call it rule-making or not, there needs to be a valid basis for the agency's action. And, if, in fact, the data base or the facts upon which the agency purports to act are not valid, you have got to give the participants an opportunity to address that question and whether you do it by some other kind of procedure within the rule-making, I think remains open **[453]** to ingenuity, the authorities in the field have various suggestions, the Administrative Conference, at its last plenary session, had a recommendation having to do with "Rules of General Applicability," and they made some suggestions as to how these difficult problems should be approached. I would hope this might be a vehicle whereby we could assist the Commission in that regard.

MR. GLEASON: I can partially answer your question right now. I don't think it is necessary as part of the rule-making proceeding on subjects such as this to have full rights of cross-examination and discovery. I do think, as you indicated, that it is necessary to provide a forum for development of a full and adequate record. There are other ways that can be more expeditiously accomplished, when you are talking about matters, sophisticated matters of science and technology, involving scientific and technological facts.

I think Dr. Steindler has suggested one alternative. The Forum Lawyers Committee issued a report in October 1970 considering AEC licensing procedures, and we recommended in that report — I would be happy to supply it for the record — that the Commission explore procedures such as this one being held now. We think there is a wide range of procedural rights that can be afforded to parties in rule-making type procedures without getting into full adjudication, which we believe often stands in the way of compiling

an [454] adequate record. I think Mr. Roisman is espousing a position which is consistent with administrative law which grew up in the 1930s. This was the classic approach to quasi judicial proceedings. But in the 30 or 40 years since then, we have learned a great deal, we are a much more sophisticated technological society today, we find the rules of common law and administrative procedures do sometimes stand in the way of compiling an adequate record. We think the Commission has given this Board the flexibility to compile the kind of a record which would be necessary in order for them to have the information before them that they need to make a reasonable judgment on the alternatives.

We don't think it is necessary to go back to the traditional cross-examination and discovery route, and we particularly don't think so until you have exhausted all of the possibilities within the confines of this particular proceeding.

CHAIRMAN PAGLIN: This is what I was referring to earlier, Mr. Gleason. I would repeat again I would hope the participants would come forward with specific suggestions as to available procedures.

Dr. Steindler?

DR. STEINDLER: I have one more question. There was some major emphasis placed on the notion that the description of the fuel cycle in its individual pieces and
[455]
plants not become an operating limit. In the light of alternatives 1 and 2 and the use to which that document or its sons and daughters is going to be put, how would you justify or what reason do you give to avoid placing an upper limit on, say, the discharges from a, for example, a UF-6 production facility, which are, in effect, those that are

given here, recognizing that the range of impact, local impact, of a particular plant, obviously exceeds the averages in both directions, but it is the upper one that people are generally concerned about.

MR. GLEASON: I think Mr. Wiggin will want to respond with respect to the technical considerations, but let me just say this, that you don't use a butcher knife for heart surgery, because it wasn't designed for that purpose.

We were not objecting to the establishment of designs for operating limitations. Such conditions are in the license conditions and regulations. We don't object to that at all. But when your approach is to, as a model approach, with the objective of getting an overall assessment, a generic assessment of the environmental impact, those numbers are arrived at for an entirely different purpose, and they are not designed with the objective in mind of establishing operating limitations.

Let me emphasize, we don't object to operating limitation, but we object to taking numbers that have been
[456]
developed for a generic environmental impact statement and applying those particular numbers as operating limitations. It goes right to the heart of the model approach in the survey. If you take the model light water reactor there, as Mr. Wiggin pointed out, it is part PWR and part BWR. You can't design that reactor, therefore, you can't establish those operating limitations on it, because you just can't design it. So it is just a question of making sure we understand the purpose for which the numbers were put together in the survey, if they are and that they are used for that purpose.

MR. WIGGIN: I don't think I have anything particularly to add to what George said, other than to emphasize that if

your end objective is to establish operating limits for a specific, identified facility on a specific site, I simply don't think you go starting from here. You simply wouldn't use a model approach.

DR. STEINDLER: Let me ask the second question. If this document were to be provided with a, as has been mentioned and suggested, perhaps, a few times, with not only the model performance on the environment, but also the range of either current practice or the range of numbers used for any particular emission or what have you, would you consider the upper limit of that range, upper presumably also meaning the most severe environmental impact, as being representative of an upper limit to the actual operation of [457] any specific plant?

MR. WIGGIN: I am not sure you can make a generalization, I am not sure I would agree to that on a generalized basis. I think you would have to look at each individual, at least, each individual step in the fuel cycle to see if, indeed, that would work, and, indeed, it would, I think, call for a more severe test of the model approach, the way the numbers have been generated, the assumptions used and than, I think, perhaps has been done by anybody other than by the AEC staff up to this point in time.

MR. GLEASON: We don't mean to suggest that you — necessarily suggest that you can't establish operating limitations on some broad, perhaps, generic basis. I think that Appendix I proceeding was an effort in that direction.

I don't wish to comment on the merits of that, but it may be possible to take that approach to the establishment of operating limitations.

But you have to start with that objective in mind and develop the numbers with that objective in mind, and those

are not the numbers in the survey. That is why we would object to it being considered as such.

DR. STEINDLER: You understand all I am trying to do is put into the record for someone else to review a scope of potential points that may well be raised or should be raised in connection with the study. That is all I have.
[458]

CHAIRMAN PAGLIN: Mr. Gleason or Mr. Wiggin, do you have anything further?

MR. WIGGIN: No, sir.

CHAIRMAN PAGLIN: We thank you for your presentation.

Off the record.

(Discussion off the record.)
[459]

CHAIRMAN PAGLIN: On the record.

May we resume?

Before we commence with Mr. Freeman, Dr. Steindler has some comments.

DR. STEINDLER: These are comments for the record, more than anything else. But I think they are probably addressed to the world at large as well.

It seems to me that the course of the questions and discussion we have had here could possibly lead somewhat to misinterpreting what these hearings are all about. The topic of discussion here is only a very small part of the total environmental statements that are prepared for all aspects of the fuel cycle.

I presume it is made eminently clear to the public, the press, the participants here, and anybody else, that for each

facility under license is prepared in excoriating detail and great analysis an environmental impact statement which is subject to review, analysis, and I am sure severe argumentation, both among the Staff itself and with the owner of the facility and whoever else, possibly including Intervenors, and that this particular statement is not designed to take the place of those, at least certainly as I understand it, and I think that is correct, and this is simply in addition to that part which is applicable to the reactor aspect.
[460]

I don't know if that has come through clearly or not, but a portion of the discussion, I think, has been leaning toward the notion we are trying to replace the environmental impact statement. I don't think people ought to walk out of here with that impression, should they hold it.

CHAIRMAN PAGLIN: Thank you, Dr. Steindler.

VOICE: May I ask a question? I am not with any organization, I am just one of three billion people that are a little bit tired of the simian-type mentality among the scientists, people who call themselves scientists.

Now there is something, solar power, that has been done in France. Now I understand that the whole thing —

CHAIRMAN PAGLIN: Excuse me, madam —

VOICE: I am just going to say about three more words, and that is that everything is get up a little steam, to run a turbine engine to create electricity, that is it, just to get up some steam, isn't it, the whole thing simplified, that is it. Yet there is a solar power thing in France that gets up 7000 degrees Fahrenheit, which certainly would boil a little water to get a little steam.

CHAIRMAN PAGLIN: May I ask you to hold your remarks? At the beginning I indicated when we completed

our proceeding, if there was anyone who felt it desirable to make additional comments, we would be glad to call upon them. So if you will do us the courtesy of abiding by that
[461]
procedure.

VOICE: That is my total comment. I thought you were going to just fluff the rest of the people off.

CHAIRMAN PAGLIN: No, that is not our intention.

I started to make a comment of appreciation to Dr. Steindler for his remarks, but I wanted to note in point of time that none of the members of the press were here at the time. I would hope to the extent that Dr. Steindler intended his remarks for the members of the press who were sitting here, perhaps when we are through, they can be advised of what it was he said, which I think is quite significant and quite important.

Well, may we now commence Mr. Freeman's presentation?

STATEMENT OF GEORGE C. FREEMAN, JR., BALTIMORE GAS & ELECTRIC COMPANY AND OTHER NAMED UTILITY COMPANIES APPEARING JOINTLY.

MR. FREEMAN: Mr. Chairman, the fuel cycle survey is an important first step toward the comprehensive assembly of information on the incremental environmental effects of nuclear power plants over the whole range of the nuclear fuel cycle.

As a practical matter, the information assembled there has not been previously available for use in the overall analysis of the environmental effects of individual reactors. We are confident that the survey will be corrected, [462] improved and supplemented as a result of this rulemaking,

and further supplemented from time to time in light of the rapidly emerging technology in the nuclear industry.

Issuance of the fuel cycle is important for yet another reason. It represents a further implementation of the Commission's sound policy begun in the ECCS and the as-low-as-practicable rulemakings of treating generic issues generically, rather than permitting the redundancy and indeed risking the inconsistency inherent in their piecemeal consideration in individual licensing cases.

This is sound administrative practice. It follows the recommendations of the Council on Environmental Policy, and indeed the recommendations of many of us who represent the industry and many who represent the environmental movement.

And as pointed out in detail in our letter of January 15, proceeding in this generic way is legally permissable.

As to the amendment of 10 CFR Part 50, we believe that the adoption of Alternate 1 as stated in the original Notice of this proceeding, or as restated by the Staff, is legally permissable if the essential factual premise upon which it is based is sustained by the final complete record of this proceeding.

That premise is that in every instance the **[463]** incremental adverse effects of a proposed reactor on those portions of the nuclear fuel cycle considered in the survey will be so small that they would not alter the overall balance of costs and benefits for the nuclear plant mandated.

As far as existing plants or plants that are proposed and currently in licensing proceedings are concerned, as far as we know, that appears to be abundantly clear, and indeed as far as we can see in the future, that should always be the case.

But that hypothetical question would be completely eliminated from this proceeding by adoption of revised Alternate 2 as set forth on page 10 of our January 15 letter. For that and the other reasons set forth in our letter, we accordingly believe that the optimum result would be to adopt the basic approach of Alternate 2, restated as we have restated it there, to make three things clear:

First, that Applicants' environmental reports and Staff detailed statements need not repeat the matters that would be covered in the supplemental fuel cycle survey.

Alternate 1 makes that clear right now. We think Alternate 2 should make it equally clear.

The second major clarification would be that the survey will be revised and supplemented from time to time to reflect substantial changes in the evolving technology or other important new information which may come to light in **[464]**
this rapidly changing field.

And third, the survey as revised and supplemented would be deemed to be incorporated by reference in all such reports and statements.

The restated Alternate 2 as set forth in the letter is somewhat lengthy, and I will not take the time of the Board to repeat it here. Copies of our letter have been made available to the press, they have been served on the other participants, and if any member of the public would like copies of the comments and the restated Alternate 2, we would be glad to supply them.

The statements made by the spokesmen for EPA yesterday strengthen our preference for revised Alternate 2. As the record now stands, it is not clear whether EPA favors unrestated Alterate 1 or restated Alternate 1, and even if

EPA favors Alternate 1 in its original form as it appeared in the notice in the Federal Register, it is not clear whether EPA regards it or reads it as requiring that the incremental adverse environmental effects of a particular reactor on those phases of the uranium fuel cycle discussed in the survey be given zero weight when included in the cost-benefit analysis for a reactor.

Mr. Rowe stated at page 162 of the transcript that, "Adoption of Alternate 1 would not foreclose us the opportunity to consider all aspects of the fuel cycle **[465]** on a particular environmental impact statement when it comes up."

It was not clear whether Mr. Rowe thought this would include discussion of the generic issues of the uranium fuel cycle that we have at issue here, or whether we would have to come up with actual numbers from the generalized ones given in the survey.

Finally, Mr. Rowe's statement at transcript 154 that EPA does not entirely concur with that section of Alternate 1 of the proposed rulemaking that states, and he quoted from the Alternate 1, "Since the environmental effects of those activities as related to a particular light water cooled nuclear power reactor have been analyzed in the Commission's environmental survey of the nuclear fuel cycle and when factored into the cost-benefit analyses, are sufficiently small as not to affect significantly the result of the conclusions."

That is the close of the quote from Alternate 1, and from Mr. Rowe.

Now unless his comment and EPA's position is clarified, such a statement in the record will tend to undermine the essential finding of fact that would be necessary to the

Commission's adoption of Alternate 1, and that is, as we have noted earlier, that in all instances of all reactors, the incremental environmental effects discussed in the survey
[466]
would, if factored into the cost-benefit analysis, be de minimus.

While EPA continues to insist that NEPA does not apply to it, AEC is under no such delusion. The AEC, the industry it regulates, particularly the utilities and utility consumers, simply cannot afford another one or two-year moratorium on nuclear licensing in the near future. Since we must assume that the Calvert Cliffs decision remains the law and since it has language in it that speaks in terms of quantifying effects to the fullest extent possible, we believe our restated Alternate 2 removes any possible question as to compliance with the severe directives of that opinion, and thus offers the safest way for the Commission to proceed.

Yesterday and today Mr. Roisman indicated that he was in accord with a basic approach to regulation that many utilities and many environmentalists like himself have urged on AEC, and that is to remove these generic issues, such as uranium fuel cycle, from individual licensing cases and deal with them in a single generic proceeding.

But it is apparent from the discussion of yesterday and today that there is a fundamental difference between him and us as to the procedures which the Commission is, first, legally obligated to follow, and second, that even if not legally obligated, as a matter of sound administrative policy, should follow.
[467]
Let me make it clear that we believe that the purpose of this rulemaking is to afford the generic forum for the dis-

cussion of the generic issues raised in the survey, just as the ECCS and the as-low-as-practicable rulemakings have afforded the generic forums for the discussion of those generic issues.

If, as a result of this hearing, the AEC adopts any of the versions of Alternate 1 or Alternate 2 that have been raised on the record to date, then the effect will be to remove debate of those major generic issues from individual licensing cases.

The effect of Alternate 1 would be to remove any reference to them in those proceedings. Alternate 2, on the other hand, would bar using those forums of individual licensing cases as the place to debate the generic issues.

That should be discussed here. It would, however, leave the question of the applicability of the ultimate findings of this rulemaking open for the limited inquiry as to their applicability to the particular plant in much the same manner that we now permit limited discussions of the applicability of the ECCS interim criteria on Appendix I to such proceedings.

To grossly oversimplify what we have in mind, if we are talking about a 2000 megawatt plant, we have obviously got to take the generic information that will be reflected
[468]
in the final revised version of the survey and factor it up because it will there be shown only for a typical 1000 MW reactor. We do not agree with Mr. Roisman in his legal conclusion that NEPA or APA requires that interested individuals must be given rights of formal discovery, oral cross-examination and other presently recognized adjudicatory rights in at least one AEC forum, either in the plant

licensing proceedings or in the generic proceedings on every relevant question of fact or policy involved in the construction of a nuclear facility.

Such a position ignores the essentially dual nature of regulatory commissions such as AEC, as both quasi-judicial and quasi-legislative bodies.

If accepted, it would inevitably lead to the complete judicialization of the regulatory process and it would really turn the AEC into a specialized court which would be essentially similar to the Tax Court or the Court of Patents Appeals. We do not believe that Congress ever intended such a result when it enacted the Atomic Energy Act, APA, or NEPA.

Turning to what should be sound administrative policy, we believe, as we stated in our letter of January 15, that some means should be provided in generic proceedings, whether they are called adjudications or rulemakings, for enabling those concerned to raise legitimate questions of fact [469] on the record and for seeing that adequate answers to those questions are obtained on the record.

The position we are taking here at AEC is consistent with the position members of our industry have taken at EPA. We are ready, willing, and able to do whatever we can to see that Mr. Roisman and his clients and all of the participants here are able to obtain answers to valid questions on the record here. I repeat that.

We hope that we will receive like assistance when it comes to EPA rulemakings from them. Where we differ with Mr. Roisman on this subject is that we believe there are several ways in which this major substantive result can

be obtained. The formal adjudicatory techniques of discovery and oral cross-examination provide one way of obtaining that result. But there are other ways.

One is the method we recommended to the Board in our letter of January 15, and I might say that I think the Board at the prehearing conference on January 17 adopted the substance, if not the form, of that recommendation. It has clearly indicated on the record there, and in the two days that we have had these proceedings here, that participants could and indeed should raise all of the questions they have concerning the matters at issue here, in their written or oral statements. And the Board has indicated it will assure that the questions it regards as germane to the **[470]** issues here are answered in one way or another on the record that is eventually transmitted to the Commission.

Indeed, the Staff has indicated it will have its experts on hand to answer all of the Board's questions throughout this proceeding and the Board has also urged that other participants here with specialized knowledge be similarly prepared to respond to its inquiry.

Dr. Radford and Dr. Kendall yesterday raised some such questions on the record. We believe it is incumbent on them now to test the procedures available to it in this rulemaking before they may legitimately complain about their adequacy. They have asked a number of questions already. If they have remaining questions in mind, it is incumbent on them to raise those questions immediately, while the means for obtaining answers through Board questioning of participants is at hand.

The adequacy of the procedures afforded here for obtaining an adequate record for the Commission, or indeed court

review, should be tested concretely rather than being complained of theoretically.

Mr. Roisman has indicated he will brief the issue, and if so, we will be glad to reply to it.

Meanwhile, however, we believe it is incumbent on him to utilize the practical procedures available to him now. **[471]**

As to substantive matters, the Board yesterday in its questions, and the participants in their written and oral statements, have raised questions of fact that should be answered on the record, and those answers should be subsequently factored into a revised survey.

To aid the Board in seeing that the record is complete, we intend to review it, including all of the written comments yet to be received from CNI, and that raises another problem we would like to discuss with the Board later, and point out those written comments which, in our opinion, require further discussion on the record. We believe that other participants should do the same, particularly if they intend hereafter either at the Commission or in a court review to claim that the record is inadequate because certain questions were not addressed.

After the Board has reviewed these questions, whether submitted the first time or pointed up in the second submission of the various participants, and fully re-examined the state of the record, if it believes that the record does not reflect an adequate answer to these questions, it should, as it indicated at the prehearing conference, schedule additional days of questioning of the Staff or such participants as it deems necessary to assure a complete and thorough record.

The Staff has already assembled a significant [472] amount of information in the survey. They have their witnesses here. We are confident that under the Board's guidance they will do whatever is necessary to see that the substantive right to full inquiry and to a full and complete record will be assured in this rulemaking.

That concludes our oral statement.

CHAIRMAN PAGLIN: Dr. Steindler?

DR. STEINDLER: In keeping with my comment before you started, you indicated that the Applicants need not repeat the matters that are already covered in the survey, and I think I ought to re-emphasize that those are the Applicants for a reactor license, and not the Applicants for a reprocessing license, or UF-6 production license.

MR. FREEMAN: Yes, sir.

DR. STEINDLER: On a perhaps more substantive matter, you indicated that this is basically a genetic forum —

MR. FREEMAN: Generic forum.

DR. STEINDLER: Oh, I'm sorry.

MR. FREEMAN: My southern accent sometimes —
(Laughter.)

DR. STEINDLER: I will assume that that is my hearing that is at fault.

Okay, generic. Since the proceedings cover many parts, or at least are easily divisible into many parts, and one method of division represents the various aspects of [473] the fuel cycle, are you suggesting one way to arrive at a satisfactory record which could stand as a technical base to be used for the environmental purposes of the reactor license hearings would be to hold generic hearings on each separate issue, in other words, on the mine and on the mill, and on the UF-6 production site, and on the fabrication site plant and so on? And in order to arrive at what might not be a continuously contested topic, clear the technical record in that kind of a proceeding? Or am I extending what your thoughts were beyond reason?

MR. FREEMAN: I think the basic purpose, as set forth in our letter of the 15th, of this proceeding, as we view it, is to compile what will be an accurate and fairly complete technical document for incorporation by reference into the environmental statements to individual power plants.

We think that is clearly within the interpretation of NEPA, which permits agencies to incorporate by reference not only their own internal reports, but scientific treatises.

We thing that that is the basic purpose of this proceeding, to compile the technical record on the incremental adverse environmental effects that construction of a nuclear reactor will have on those portions of the entire uranium nuclear fuel cycle which are currently outside current licensing proceedings, and which are covered in the survey.

DR. STEINDLER: That is all I have.
[474]

CHAIRMAN PAGLIN: Dr. Geyer, do you have some questions?

DR. GEYER: No questions.

CHAIRMAN PAGLIN: I have a question or two, Mr. Freeman.

You made reference to the criticality of the position of EPA and Mr. Rowe's testimony.

MR. FREEMAN: Yes, sir.

CHAIRMAN PAGLIN: Do you recall that I brought to his attention the fact that he was basing, or at least I thought he was basing his position in terms of the language before it was amended, and I read to him, I think Mr. Murray agrees it should have been read to him, the amended language? For the record, it appears on pages 162 through 164 of the transcript. And I asked him whether or not with the new amended language for Alternative 1, it would change the position of the EPA with respect to their comments, and in all fairness, he said he didn't know, he would have to take some time to consider it, and would come back if it changes anything.

I take it from what you told us that we should, if not await, at least request some statement by EPA as to whether or not this changes their position in any regard?

MR. FREEMAN: Yes, sir. I think it is very important that EPA clarify on the record just what it is **[475]** advocating when it advocates Alternate 1.

And secondly, I think it is also important that they think through and clarify the implication of the statement which appeared in his prepared testimony which raised some doubt in my mind, anyway, as to whether or not they agreed with the underlying factual premise which I feel it would be necessary for the Commission to find, substantiated by the record here, if it were to adopt Alternate 1.

So I think EPA needs to clarify its position in two regards.

CHAIRMAN PAGLIN: I would hope that this portion of the transcript, Mr. Murray, could be called to Mr.

Rowe's attention specifically, and see if he can't give us a response.

MR. MURRAY: We will undertake to do that, Mr. Chairman.

CHAIRMAN PAGLIN: Thank you.

One further question, Mr. Freeman.

In speaking about the available procedures as contrasted with Mr. Roisman's position, do you contemplate or is it within your contemplation and as part of a "rulemaking type hearing" that if the need arose, you could actually use the particular techniques of, let us say, what would otherwise be an adjudicatory case?

In other words, within your proposition, do you **[476]** conceive of the possibility of the Board or the Commission permitting what appears to be at least an adjudicatory type proceeding with some cross-examination in order to determine the validity of certain facts in a limited sphere?

MR. FREEMAN: Yes, sir, I think it is completely within your discretion. I would think that the kinds of situation where I would think limited oral cross-examination might be useful to the Board would be if there was, through written inquiry or through written questions and answers or responses, there was still doubt pinpointed into crucial questions of fact where the Board felt that the right — the Board itself — to orally examine a witness or indeed to give the participants the limited right to orally cross-examine a witness on a specific subject, to find out a question of disputed fact, that that would be entirely appropriate.

I think before anyone could complain that they were prejudiced from a due process point of view by the pro-

cedures followed here, when coupled with the overall scheme of commission regulation, which would not permit them in individual licensing cases to pursue such a line of inquiry through adjudicatory techniques, I think it would be incumbent on them in this proceeding to pinpoint the areas where they believe that such questioning would be essential to assure an adequate and complete record and if they are failing to do so, I think that just makes that — I think they would have waived **[477]** any right they might have.

CHAIRMAN PAGLIN: Here again — you don't have to respond to this necessarily completely now, as I indicated earlier this morning, in your papers, possibly, how would you accommodate or observe, how would you observe the proscription of the Commission in its notice that there was to be no cross-examination in this proceeding, other than questioning by the members of the Board?

MR. FREEMAN: I think under those circumstances —

CHAIRMAN PAGLIN: Would you seek a modification?

MR. FREEMAN: I certainly do. I think under those circumstances, confronted with a specific question in a specific context, if the Board called certain witnesses and it felt that under its own questioning, the legitimate concerns of some of the participants as to the adequacy of the record had not been met, then I think it would be appropriate for this Board, under those extraordinary circumstances to seek further advice and guidance from the Commission and to make its recommendations to the Commission.

I think it would be necessary to have a supplemental order from the Commission in that event, sir.

CHAIRMAN PAGLIN: Again, because the order as it stands now, besides saying no cross-examination, also indicates that the certification of the transcript, so to speak, to the Commission will be without a recommendation or a decision **[478]** as such from the Board, but with an indentification of issues.

MR. FREEMAN: I think Mr. Gleason very well pointed out that Mr. Roisman wants the formal right of discovery, but there is no indication that he has asked anybody for anything, and it has been denied to him.

In fact, I think the whole Staff position in this proceeding has been to make everything available to everybody. I think before Mr. Roisman can complain that he has been denied the right of discovery, I think he ought to say what he wants that he has not been able to get.

Similarly as to the right to cross-examination, the only way I can see that right arising would be if there were some documents before the Board by some author and there was some question concerning its authenticity or whether he still held those views, again the Board itself might, in such a situation, obtain a written communication from him that would clear up the doubt.

It is very rare — I really just can't see abstractly — I can't hypothesize the fact situation where the right to oral cross-examination would be necessary. I imagine that there could be some circumstances where it might be necessary, but I think we would have to look at those matters in terms of concrete situations and absent an exhaustion of the remedies which are afforded to all participants in this proceeding, and the encountering of such a situation **[479]**
by pursuing those procedures, I don't see how anyone is

prejudiced or could be prejudiced by the way the Commission is proceeding in this matter.

CHAIRMAN PAGLIN: Finally, Mr. Freeman, you indicated that in your further wirtten submission, you will point to the issues, at least as you see them, that require further consideration.

MR. FREEMAN: Yes, sir. And that brings me to one point I meant to mention and haven't, and that is that yesterday Mr. Roisman indicated that he was preparing a very massive submission.

Under the procedures we now have, that would come at the end of the proceedings, and in effect none of us would have any opportunity to further comment on that.

CHAIRMAN PAGLIN: I anticipated that, Mr. Freeman, and I would prefer to handle that matter as a procedural thing at the conclusion of the other testimony. I would seek the views of the participants at that time.

MR. FREEMAN: I do think some method should be allowed here so that before the record is finally closed, if any of the participants feel there are still substantial questions answered on the record, they should be permitted or indeed required to bring those questions to the attention of the Board so that the Board may take one final look to see whether or not any supplemental proceedings are in

[480]

order, in order to complete the record for the Commission.

CHAIRMAN PAGLIN: As I say, we will deal with that matter at the conclusion of all of the oral testimony, because it is a procedural matter that I agree requires some resolution.

Does that complete your presentation?

MR. FREEMAN: Yes, sir.

CHAIRMAN PAGLIN: We thank you.

We think this is an appropriate time at which to call the recess for lunch. It is now five minutes to 1:00. We will recess until 2:00 o'clock, at which time we will hear the rest of the participants and such other procedures that are required.

(Whereupon, at 12:55 p.m., the hearing was recessed, to reconvene at 2:00 p.m., this same day.)

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF	
RULE MAKING HEARING ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE	Dkt. No. RM-50-3

SUPPLEMENTAL WRITTEN STATEMENT OF GENERAL ELECTRIC COMPANY

General Electric Company has reviewed the filings of the various individuals and groups in the above-referenced proceeding and the testimony of the participants at the hearing conducted February 1 and 2, 1973 and is filing this supplemental written statement pursuant to the Commission's Notice of Hearing, dated December 27, 1972.

Upon review of the written filings and testimony at the hearing, General Electric has concluded that the contents of its written statement, dated January 26, 1973, previously filed in this proceeding are still valid and applicable to this proceeding. In addition, we believe that several of the comments contained in that written statement with regard to the Staff's approach are extremely appropriate with regard to the testimony received at the hearing.

We would like to emphasize our strong support for the generic treatment of the environmental effects of the nuclear fuel cycle and our belief that either of the alternatives proposed by the Commission would be adequate to fulfill the requirements of NEPA. We continue to favor the third alternative proposed by the utility group represented by Mr. George Freeman, Jr. with appropriate attention given to our suggested improvements.

In regard to the environmental survey document itself, and the supporting technical arguments which were made in the proceeding, we would like to reiterate our positions on the following points:

1. In assessing environmental costs for cost-benefit balancing, it is essential in surveys of this type, that the Commission rely on realistic estimates of impacts as opposed to conservative estimates such as are sometimes used in assessing the safety of various systems.
2. We believe that the Commission should adopt a consistent posture in regard to evaluation of environmental effects and that these environmental effects should be evaluated at the point of actual impact in the environment using recognized factors for occupancy, shielding from structures, and dilution effects prior to the emissions coming in contact with the actual recipients. It is particularly disturbing to see assessments of environmental impact and concentrations made at the point of discharge of gaseous and liquid effluents for the sake of convenience without considering what the actual impact of these releases will be on the affected parties.
3. We believe that a basis for comparison such as natural background concentrations and radiation levels should be stated to provide a reference point from which valid cost-benefit balancing can be initiated.

In addition to the foregoing comments, we offer the following comments on specific portions of the testimony:

STAFF TESTIMONY

In the discussion of waste disposal practices (pp 85-86), the Staff estimates the releases of radioactive materials in the liquid effluents for the model plants and states that waste such as cladding hulls are buried on site. While this

has been accepted practice in some plants, we believe that the report should indicate that future plants may not utilize these waste management practices and that therefore environmental effects from such plants will be further reduced below those ascribed to the model plant. For example, the Midwest Fuel Recovery Plant does not discharge any radioactive materials of process origin in its liquid effluent streams, and the cladding hulls are not buried on site but are retained within a stainless steel lined reinforced concrete structure at a below-grade elevation.

Mr. Smiley referred to achievement of the "as low as practicable" objectives, using the best possible technology (p 147). We believe that in many instances the use of the best possible technology is neither practicable nor justified as there are many things which are possible but yet would have no measurable effect in reducing impacts. While we agree with the maintaining of radiation exposures to plant personnel and the general public as low as practicable, we do not believe that requiring use of "best possible technology" to be a necessary corollary for achieving that objective.

In regard to Dr. Pittman's testimony, we are concerned about conservative assumptions which have been utilized in evaluating the impact of alternate waste storage facilities. The use of such conservatisms, while they overstate the end effects, may be such as to raise a question of credibility regarding the actual analyses. In regard to the accident analysis, the assumption was made that if a waste can were dropped, 100% of the contained contents would become airborne in finely divided particles such that they would be swept from the room and into the ventilation system (p 105). We believe that such assumption regarding this source term is conservative by several orders of magnitude

and, in fact, beyond the realm of physical possibility. Additionally, Dr. Pittman states categorically that if the cooling system failed, the stored containers would melt (p 101, 103-105). Based on the data given in his testimony, it appears to us very unlikely that containers of the size described containing only 5 kW of heat could melt down. Further discussion of this in the Survey would be appropriate. In summary, we feel that at every stage of the report the best technical assumptions should be made and the best models used to provide realistic estimates of what the actual releases will be and what their impact in the environs will be.

EPA TESTIMONY

While a review of fuel cycles other than the nuclear fuel cycle is not appropriate for this proceeding, we do support Mr. Rowe's request that an environmental survey of other fuel cycles be undertaken. We believe that such an environmental survey would demonstrate that the environmental impact of the nuclear fuel cycle is not only small in absolute terms, but also in relative terms.

STEVE J. GADLER TESTIMONY

This testimony seems to be wholly without merit as it lacks any scientific or technical basis to support the allegations which have been raised. There does not appear to be understanding of even the most fundamental of engineering principles. An example of this was Mr. Gadler's attempt to apply an air-filtration efficiency of 99.9%, which is applicable only to the effluent air stream to the input or feed to a reprocessing plant in order to estimate the alpha emissions from such a plant (p 174). We find that Mr. Gadler's testimony does not cast any clouds on the credibility of the Staff's environmental survey report.

TESTIMONY OF DR. E. P. RADFORD

We believe that it is significant to note Dr. Radford's statements in regard to the timeliness of nuclear fission power in meeting the nation's energy needs and also his statements regarding his opinion that the Staff's as low as practicable Appendix I guidelines are too low and represent an overreaction by the Staff. We believe that evaluation of Dr. Radford's comments within the context of these two statements will indicate that his concerns are principally those of a scientific nature regarding the desirability of further study as to the effects of low-level radiation exposure and as to the movement of these radioactive materials in the environs. We do not believe that Dr. Radford's comments, therefore, amount to an attack on the nuclear power program or a request of further delays in the licensing of nuclear facilities, but rather, as an effort to obtain support for further scientific studies in the area of low-level radiation effects. Dr. Radford did raise four specific points principally in regard to the Midwest Fuel Recovery Plant on which we would like to comment:

1. *Meterological Diffusion Estimates (pp 240-241)*

We believe that the factor of 3 difference between the estimates of the Department of Commerce and those of General Electric can be attributed principally to the simplifying assumptions which were used by the Department of Commerce and to their lack of actual meterological data in making their estimates. Their estimates were based on generalized diffusion parameters and averaged meterological conditions, whereas the estimates performed by General Electric and substantiated essentially by the Staff were based on actual site characteristics and actual measurements of site meterology over an extended period of time.

2. *Remote Maintenance Techniques (p 246)*

Dr. Radford expressed concern over the ability of the company to maintain the plant in its as-constructed condition because of the fact that once the irradiated materials have been introduced into the canyon, actual human entry into the canyon will no longer by possible. The equipment at the MFRP is designed such that it can be removed using the overhead canyon crane and viewing equipment without requiring human entry into the canyon. This is based on plant maintenance practices which have been successfully used in Commission facilities for almost 30 years. Thus, if a piece of equipment in the canyon should fail to function properly, it would be removed and decontaminated and a new or repaired piece of equipment would be reinstalled in its place, all without requiring human access into the canyon-processing area. Thus, the plant is designed to be maintained in its original operating condition throughout its operating life.

3. *Detection of Upsets (p 259)*

Dr. Radford also expressed concern that there could be undetected higher-than-normal releases of radioactivity into the MFRP confinement systems. In this regard, it should be noted that this is basically a chemical process and that there are extensive process monitors throughout the plant with remote readouts and alarms in a central control room. Further, the sumps in the process cells are equipped with liquid-level detectors and alarms such that any spillage from vessels would be detected and alarmed. Also, the off-gas systems all have radiation monitors and alarms such that any higher-than-normal releases into the process or ventilation off-gas systems would be promptly detected

and identified. Thus, there would be instantaneous detection of any substantial process upset or release of higher-than-normal amounts of radioactivity into the process off-gas system, thereby assuring prompt detection and initiation of protective measures.

4. *Accumulation of Radioactive Materials in the Plant (p 259)*

In regard to Dr. Radford's concern in this area, it should be pointed out that there are provisions for detecting leakage from the vessels and for returning such leakage to the process system for disposal as a normal process waste. Because of these provisions for clean-out of the cells, the maximum accumulation at any time in the plant would be only a very small fraction of the in-process inventory at that time. Therefore, the effects on radiation dose rates in the personnel-occupied zones of the building would be immeasurable and of no significance.

TESTIMONY OF DR. HENRY W. KENDALL

Most of Dr. Kendall's testimony was not within the scope of this proceeding, and we have not undertaken to prolong the record with detailed analysis of these aspects of it. However, we would like to point out to the Board that Dr. Kendall extracted one number from Wash-1250 (p 268) without referencing the six pages of discussion putting that number in appropriate context. He proceeded to equate General Electric's accident probability projections to that number (p 269). General Electric's most recent probability projections are contained in its comments on the AEC's Draft Environmental Statement in the ECCS Rule Making Proceeding (Docket No. RM-50-1). These comments estimate a pipe rupture probability ranging from 1 in 10,000

to 1 in 100,000, certainly significantly different from the 1 in 1,000 to which Dr. Kendall sought to compare it. Neither of the documents referenced by Dr. Kendall support the extrapolations which he attempted to make from them.

Dr. Kendall expressed concern regarding the capability for interim storage of high-level radioactive wastes at or near the earth's surface in engineered storage facilities. We believe that the satisfactory containment of such materials for the necessary periods of time is well within the scope of presently available technology. In this regard, it should be pointed out that the radiation dose rates associated with the penetrating gamma radiation and the heat dissipation which make the waste difficult to contain will be greatly reduced within a few decades. After a storage period of several years, waste should require no cooling and substantially reduced radiation shielding. Thus, at that time the problem becomes principally one of containment of the dry material which substantially reduces the requirements that would be placed on such storage containers.

We trust that the foregoing comments will be of assistance to the Commission in its review and deliberations in this rule making proceeding. The opportunity to participate is appreciated.

Respectfully submitted,

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NUCLEAR FUEL CYCLE PROCEEDING — 50-3

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CONSOLIDATED NATIONAL INTERVENORS

UNION OF CONCERNED SCIENTISTS

STATEMENT WITH RESPECT

TO LEGAL CONSIDERATIONS

OF THE PROPOSED REGULATIONS

ON THE NUCLEAR FUEL CYCLE

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I INTRODUCTION

Under Section 2 of the Atomic Energy Act of 1954, as amended, a purpose of the Act is to provide regulation to protect the health and safety of the public. The public health and safety under the Act § 3, serves as the limiting factor in the development and utilization of atomic energy for peaceful purposes. The Commission has authority to revoke or to refuse a license under §§ 103 and 186 of the Act for a facility which does not meet the health and safety standards of 10 CFR 50.40(c). Therefore, it is our position that if the Commission finds as the result of the hearings on the Fuel Cycle Survey that utilization of nuclear energy is inherently inimical to the health and safety of the public, because of the existence of health and safety hazards for which there are no presently available acceptable solutions then it is obligated and has the present statutory authority to call a moratorium on further construction and operation of nuclear power plants.

Appendix D of 10 CFR Part 50 essentially follows NEPA which requires, *inter alia,* a discussion of the environmental impact of proposed actions that may effect the environment. The discussion of the environmental impact is required to insure that the goal of NEPA — to prevent initiation of government action which will do irreparable damage to the air, land and water which supports life on earth — is met.[1]

It should be further noted that the procedures of Section 102 of NEPA is not intended just "to file detailed impact studies which will fill government archives but to give effect to the goals of Section 101 of NEPA." *EDF* v. *Corps of Engineers,* 4 ERC 1721, 1726 (8th Cir., November 28, 1972).

There is no doubt that the fuel cycle represents a relevant part of the environmental effect of a nuclear power plant

[1] 115 Cong. Rec. 40416 (1969) (Remarks of Senator Jackson).

and that a detailed statement, does not comply with the requirements of applicable law if it does not consider the issues of mining, milling, manufacturing fuel and transportation, reprocessing and disposal of high level wastes. See Natural Resources Defense Council's brief on this issue before the ASLAB, In the Matter of Vermont Yankee, Docket No. 50-271.

The required environmental discussion is not limited to just the factors relating to the effect of the proposed action on the air, water, and land but also to the factors that may effect the quality of human environment. *Hanly* v. *Mitchell,* 4 ERC 1157 (2nd Cir. 1972) If in *Hanly, supra,* the court required the consideration of environmental factors such as noise, traffic, mass transportation, crime, congestion, and drugs in the statement for a jail, the potential security problems in the transportation of nuclear material is an aspect of the fuel cycle that should certainly be considered in the fuel cycle's statement.

The only legitimate question should be how to develop procedures for disclosure of this impact which are both fair and avoid unnecessary delay.

In the past the Commission has limited consideration of environmental matters relating to the fuel cycle to environmental effects of the

> "Transportation of fuel elements from the fuel fabrication plant to the reactor as well as the transportation of spent fuel elements from the reactor to the fuel reprocessing plant and the transportation of packaged radioactive material from the reactor to low level burial grounds." "Guide to Preparing Environmental Reports by Director of Regulation" Sept. 9, 1971.[2]

[2] Under the regulations then in effect, this Guide does not constitute a valid regulation of the Commission and is merely a statement of position of the Director of Regulation.

The Commission ASLAB agreed with this limited interpretation of the required scope of an environmental impact statement. In its decision of *In the Matter of Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station),* Docket No. 50-271, Memorandum and Order, June 6, 1972 (ALAB-56), and Decision, October 11, 1972 (ALAB-73), the Appeal Board held that mining and manufacturing of reactor and reprocessing and disposal of nuclear wastes are not within the scope of the environmental review prescribed by NEPA and AEC's regulations.

However, in *Calvert Cliff's Coordinating Committee* v. *AEC,* 449 F 2d 1109, 1112 (D.C. Cir. 1971) The Court said that the Commission is required by NEPA to consider environmental issues just as it considers other matters within their mandate". Therefore, AEC, by not considering the full environmental effect of the fuel cycle, has been following a policy contrary to NEPA and also has disregarded NEPA's legislative history that "[N]o agency will [now] be able to maintain that it has . . . no requirement to consider the environmental consequences of its actions."[3]

In 1971, the court in *Calvert Cliffs, supra,* at 1119, expressed shock with the delay the Commission took in carrying out NEPA's requirements. Now a year and a half later, over three years after NEPA's effective date, the Commission is still proceeding at a "funeral procession pace" and has yet to fulfill its legal obligations to consider the full environmental effects of the fuel cycle to the "fullest extent possible" in its review process.

II PROPOSED ALTERNATIVES

The AEC has now questioned their position of excluding environmental effects associated with the fuel cycle. Two

[3] Senator Jackson, *supra,* Note 1.

alternative regulations, which take into account the environmental effects associated with the uranium fuel cycle, are being considered. Both alternatives are based on the information provided in the Regulatory Staff's report entitled, "Environmental Survey of the Nuclear Fuel Cycle," November 6, 1972.

A) ALTERNATIVE I

Alternative I is basically the current policy which disregards the intent of NEPA by not considering the full fuel cycle's impact on the environment. Admitting there is an impact, Alternative I concludes, on the basis of this single survey, that, "when factored into the cost benefit analysis, [the environmental effects of the fuel cycle] are sufficiently small as not to affect significantly the resultant conclusion". However, once admitting there is an impact, it is not possible merely to dismiss it if it is related to a major federal action. Section 102 c (ii) of NEPA does not state that impact statements consider only large adverse environmental effects but rather it states "any adverse environmental effect" be considered.

In fact, Judge Wright in *Scrap* v. *U.S.,* 346 FS187 (Three Judge Court) (D.D.C. 1972) and Chief Judge Friendly in *Hawly, infra,* agree that "a statement is required whenever the actions *arguably* will have an adverse environmental impact."

Alternative I is based upon the assumption that the environmental cost due to an individual plant's fuel cycle does not significantly affect the environment. However, AEC raises two questions as to the certainty of that conclusion. The first is that, "[T]here does not appear to be any way to ascertain with any degree of certainty which of the uranium mines or mills, uranium hexafluoride plants, isotopic

enrichment facilities, and fuel fabrication plants in existence or to be operated in the future will contribute fuel to a given nuclear power reactor, or which of the various fuel reprocessing plants or commercial burial grounds now in existence or to be constructed from time to time will receive irradiated fuel or wastes from any given nuclear power reactor," and

> [M]any of the various elements in the nuclear fuel cycle involve varying methods or processes with different environmental effects and there is no reason to believe that during the useful life of any given nuclear power reactor other methods or processes with different effects will not be developed.

37 F.R. 24192 (November 15, 1972)

Further at some point in time a new mill, mine, reprocessing plant or fabricating plant, etc. will be needed to expand the existing capacity because of the demand of a single additional nuclear plant. That event will certainly produce a significant incremental cost.

A similar analysis was made in *Hanly* v. *Kleindienst,* 4ERC 1785 (2nd Cir. December 5, 1972) where the Court said that the one additional factory "may represent the straw that breaks the back of the environmental camel." Therefore, NEPA requires, in cases where incremental environmental costs can lead to a significant environmental cost, that the absolute, as well as comparative effects of a major federal action must be considered." *Hanly, supra.*

Regardless of the lack of factual support for alternative I (a point which will be emphasised by our technical submittal) This alternative is also legally unjustifiable as the National Resources Defense Counsel brief in Vermont Yankee clearly demonstrates.

B) ALTERNATIVE II

Alternative II includes the transportation effects currently considered as well as the environmental costs of the fuel cycle (other than transportation of cold fuel to, and irradiated fuel from, the reactor.) However, the consideration of the environmental cost of the fuel cycle is limited to Table S-3 of the Survey. The AEC in its announcement of this rule making hearing 37 FR 2 4192 (November 15, 1972) described the survey not as *the* basis but as "*a* basis for an inforned consideration of the generic question of the environmental impact associated with the uranium fuel cycle in light water cooled nuclear power reactor licensing proceedings." The implication here is that there are other bases that may be used to form a different conclusion as to the information that should be supplied in Table S-3. The use of this Table S-3 to the exclusion of all other information does not meet the spirit or letter of NEPA § 102c because it does not provide sufficient information for the decision making process. *NRDC* v. *Morton,* 458 F2d 827, 833 (D.C. Cir. 1972)

Under Alternative II, Table S-3 is incorporated into the environmental impact statement of the individual plant. Appendix D of 10 CFR Part 50 and NEPA § 102c requires a discussion of alternatives. The discussion of alternatives that is required in the impact statement includes the alternative of not proceeding with the proposed action *NRDC* v. *Morton, supra,* at 833. However, the discussion of alternatives of the fuel cycle as a necessary part of the plant, requires a discussion of the alternatives methods for the operational steps of the fuel cycle not merely the alternative of no wastes being produced or less waste being produced. The alternative of not producing nuclear fuel and wastes belongs in the discussion of the alternatives of not building the power plant which must be part of the NEPA review

of the individual nuclear power plant and not the impact statement of the fuel cycle. The Survey does not meet this requirement of a discussion of alternative modes of operations for the fuel cycle. In fact, at S-2 it notes that future documents will consider alternative fuel cycles.

Therefore because of the lack of a discussion of alternative fuel cycles and the possibility of exclusion of responsible information, the publication of the data in Table S-3 does not meet the requirements of an Environmental Impact Statement. This view is strongly supported by the Survey itself at FW-1 where the survey states that, "[i]t, [the survey] is not a detailed environmental statement as defined in the National Environmental Policy Act of 1969 and Appendix D of 10 CFR 50 of the AEC's regulations."

If the data in S-3 is to be incorporated into the environmental impact of each plant, then it follows it should be treated as any other information included in an impact statement. Therefore, it will be circulated to the various Federal and State agencies, it will be subject to discovery by the parties, and the preparers of the survey will be subject to cross examination.

The language in alternative 2 that the environmental effect of the fuel cycle, "shall be as set forth in Table S-3" may mean that the data used in the fuel cycle will not be subject to intensive questioning such as to the validity of assumptions and to the analysis used which the remainder of the information in the environmental impact statement in normally subjected. Technical analysis without complete airing of the assumptions are often misleading and not useful. If that interpretation is followed the phrase of 102C, "shall accompany the proposal through the existing agency review process," would be meaningless. *Calvert Cliffs, supra* at 1117.

While Alternative II expands the current consideration of the fuel cycle, it has the weakness of not providing for the updating of the environmental analysis of the fuel cycle (see third alternative.) It also requires duplicate discovery and cross examination in each power plant hearing in order to fulfil the requirements of NEPA. What is necessary is a serious examination of the fuel cycle using the data similar to that in Table S-3, supplementing it with additional information, as necessary, and updating the survey, as new information is obtained.

ALTERNATIVE III

A) Generic Hearing

In view of the expressed uncertainties and the weakness of Alternative I and II a complete examination of the fuel cycle could best be done by an on going generic hearing.

This third alternative would be as follows:

In the case of Light Water Cooled Nuclear Power Reactors, the applicant's environmental report and the Commission's detailed statement shall contain a full discussion of, inter alia, the environmental effects of the transportation of cold fuel to the reactor and irradiated fuel from the reactor to a fuel reprocessing plant and the transportation of low level wastes and high level solid wastes (other than irradiated fuel) from the reactor to depositories. In such documents, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexofluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation and disposal of wastes resulting from such reprocessing, disposal of low level and high level solid wastes and transportation related to such activities (other than transportation of cold fuel to, and irradiated fuel from the reactor), to the environmental costs of licensing the nuclear power reactor shall be based on the environmental impact statement prepared for, and the findings resulting from an ongoing generic fuel cycle adjudicatory

hearing. To the extent that findings are reached different from the detailed statement, the statement will be deemed modified to agree with the findings. This generic hearing shall periodically convene to issue additional or modified findings as the generic fuel cycle's environmental impact statement is updated.

Parties to the individual licensing hearings would simultaneously become parties to the generic hearing. Therefore, objection to the treatment of the fuel cycles' environmental issue should be raised at the generic hearing. However the right to challenge the full cycle issue at the individual licensing hearing will be permitted under 1) a showing of good cause as why it was not possible to raise the issue at the generic hearing, 2) a showing that the issue is material and of substantial nature, and 3) that there has not been delay in raising the issue by the party raising it.

NEPA does not in itself require an adjudicatory hearing. It only requires that environmental issues be considered at every step of the existing review process and under the Commission's regulations the existing hearing proceedares for licensing one adjudicatory. Therefore, the environmental review to be part of the existing agency review process must also be adjudicatory. Thus, this generic hearing would also be adjudicatory in nature in accordance with Subpart G of 10 CFR Part 2, because it replaced the portion of the adjudicatory environmental review required by NEPA at each nuclear plant licensing proceeding. It would provide assurance that all environmental matters relating to the fuel cycle will be considered at one hearing. Such a hearing would provide an opportunity for all interested parties to raise valid questions as to the environmental effects of the fuel cycle.

The generic hearing may produce some of the administrative problems which occurred in ECCS. Again it should be noted that the full consideration of the environmental questions pertaining to the fuel cycle is mandated by NEPA. It

is not a flexible requirement such that mere administrative difficulty, delay, or economic cost can prevent enforcement of NEPA's provisions. *Calvert Cliffs, supra* at 1115. However, this does not preclude the Commission from taking timely steps for an orderly process which is both fair and prompt.

One step the Commission could take is to order a complete and adequate discovery prior to the hearing. Such a discovery order should include such things as a list of all documents used or relied upon in the preparation of the survey and the Commission's position. The time period for discovery should include sufficient time for the parties to obtain the above mentioned documents and examine them, as necessary, in order to facilitate interrogatories and establish the issues. This form of discovery process would prevent needless delays during the actual hearing as well as provide the opportunity for a meaningful contribution by the parties to the decision making process.

The regulatory staff would gather information itself as well as receive information from others. It would also have the responsibility of issuing a draft environmental impact statement of the fuel cycle. This statement would include all impacts of the AEC's failure to face up to this issue at an early date. If the immediate post *Calvert Cliffs* response on the fuel cycle had been what is currently proposed (over a year later), the period of delay associated with implementation of that decision could have accomadated the time needed to obtain initial findings on the fuel cycle. The AEC's decision to deal with the fuel cycle following resolution of other environmental problems rather than at the same time was ill-conceived. Having chosen that course it has no choice but to accept the consequences. All findings and statements issued by the generic ASLB up to the time of decision on an individual licensing proceeding should be

available for consideration by the Board of that licensing proceeding.

No doubt there will arise cases when a gap will arise between the time new information is submitted on the fuel cycle question and the further generic review process is completed by submitting the findings to the individual boards. Courts have given discretion to agencies in excluding evidence that updates *earlier* administrative proceedings. *U.S.* v. *ICC*, 396 U.S. 491 (1970). But an administrative proceeding where relevant evidence is excluded is open to an attack as a violation of due process if the rules for updating are not fair and reasonable *Marine Transport Line, Inc.*, v. *U.S.* 1973 F.Supp. 326, 329 (D.C. 1959).

A problem may arise when a party to a current licensing proceeding was not a party to the generic hearing and objects to the fuel cycle's findings.

In this case the Commission must use its discretion and balance the due process right with the substance of the objection, remembering there is a difference bwtween repetitious evidence and new evidence. The AEC has an affirmative duty to see that the record is complete and to consider all relevant facts. *Senic Hudson Preservation Conf.* v. *FPC*, 359 F.2d 608, 620 (2nd Cir. 1965).

Questions as to the reopening of or challenges to the generic hearing could be treated in similar fashion as modification of the Commission's regulations is presently done under 10 CFR 2.758. The Commission could establish fair and reasonable standards for challenge to or reopening of the fuel cycle hearings such as 1) a showing of good cause as why it was not possible to raise the issue at the generic hearing, 2) a showing that the issue is material and of substantial nature, and 3) that there has not been delay in raising the issue by the party raising it.

In conclusion there will be difficult procedural problems associated with making the generic hearing workable, but they are not insurmountable, hopefully they will be solved as the periodic hearing continues. In view of the Commission's delays in carrying out the required review of the environmental effects of the fuel cycle a few small delays in working out a proper procedure for the generic hearing system is not unjustified.

On the other hand the generic hearing will meet the mandatory requirement of NEPA to fully consider the complete environmental impact of the individual nuclear power plant. It will meet the "essence and thrust of NEPA that the pertinent statement serve to gather in one place a discussion of the relative environmental impact alternatives." *NRDC* v. *Morton, supra*, at 834. The concept of the generic hearing will permit consolidation of the fuel cycle questions and thus save NEPA resources that would otherwise be spent at the required individual licensing hearings. Periodically updating the effects of the fuel cycle will provide the required systematic interdisciplimary approach needed to solve the weaknesses of both Alternatives I and II which rely on a single survey that may quickly become obsolete.

B) Treatment of Environmental Impact of Known Steps In the Fuel Cycle

In some steps of the fuel cycle, different plants utilize a variety of alternative processes and operations, some of which have substantially different environmental impacts. A proper evaluation should include the environmental effect of each alternative process or operation within each step in the fuel cycle. As an example, the normalized or weighted environmental impact of the mining step should be given as in Table S-3A. Then that information should be broken down into the environmental effects of a typical open pit

mine, the environmental effect of a typical underground mine, etc. In the case of the hexafluoride production facility, the normalized or weighted environmental data would be submitted as in Table S-3A. That information would then be broken down into the environmental effects associated with a typical facility using the hydrofluoride method and a typical facility using the wet solvent extraction method, etc.

In the case where a particular process for a step in the fuel cycle has been finalized (i.e. a decision has been made to fuel the plant with uranium mined from an underground mine rather than from an open pit mine), the licensing board of the individual nuclear power plant will be able to assign from the generic fuel cycle's impact statement and findings, the incremental environmental cost associated with that process (i.e. the cost associated with a typical underground uranium mine).

Where the particular process for a step in the fuel cycle has not been finalized or the process is reasonably subject to change during the life of the nuclear plant (i.e. the uranium may be mined fron either an underground mine, or open pit mine, or both) the licensing board of the individual nuclear power plant will be able to find in the generic fuel cycle's impact statement and findings the normalized or weighted impact for the step along with the impact for each alternative process for that step (i.e. for the mining step, the board will find the normalized or weighted impact of the model mining operation as well as the impact of a typical open pit mining operations and the impact of the typical underground mining operation. The licensing board, after having access to these comparative environmental costs, is then in a position to assign a reasonable conservative value for the incremental costs associated with the step in question (i.e. the mining step in the above example).

C) Treatment of the Environmental Impact of Unknown Systems

One of the most shocking aspects of the Survey is the total paucity of data on the environmental impact of waste disposal The alleged bases for this is the unsubstantiated promise that whatever design is developed for waste disposal it will cope with all credible accidents. This approach is totally unacceptable. The purpose of an environmental analysis is to provide facts about potential environmental impact. Thus, what should be disclosed is the environmental impact of the currently developed waste disposal systems. Disclosure of the present state of the art regarding development of better systems can be included, but surely the hope that such systems will be developed cannot be used as an excuse to avoid discussing the known impacts of present methods. This is particularly relevant in as much as the AEC is determined to continue licensing plants to produce wastes even though there are no methods developed to dispose of the waste which meet the optimistic "no release" standard of the Survey.

Closely related to this waste disposal issue is the treatment of the environmental effects of accidents. There is no guarrel with the general proposition that under NEPA only so called credible accidents must be analyzed. But the statement must fully disclose the basis for justifying the relocation of the credible accidents. The criteria for determining what is credible must be disclosed and the basis for selecting that criteria must be given. Uncertanties in analysis must be compensated for by the use of conservative assumptions just as is now done for safety reviews.

D) Nature of the Generic (Consolidated) Hearing

1) *Adjudicatory Hearing*

Section 189 of the Act requires a hearing for persons affected by a proceeding. Under the Administrative Procedure Act, which is applicable to the Commission by §181 of the Act, a license is considered an order. The process for formulating an order under the APA §551(7) is adjudication. Therefore, the licensing process is adjudicatory.

This is in agreement with the testimony of former chairman Schlesinger and the general counsel, Martin Hoffman that the act requires adjudicatory licensing hearings. Hearings on Interim Nuclear Licensing before the Senate Interior and Insular Affairs Committee (HR. 13752) 92nd Congress, 2nd Session 50, 29 (1972). Roger Crampton, the former chairman of the Administrative Conference of the United States, has also noted that section 189(a) of the Act requires a trial type hearing. Licensing of Nuclear Facilities before the Joint Committee on Atomic Energy (HR 13731 and HR 13732) 92nd Cong., 2nd Session 454 (1972). In reference to the hearing process the Joint Committee on Atomic Energy has insisted that:

> The most meticulous attention be given to the scientific and technical problems associated with Atomic Energy Licensing and [The Committee] insists that there be full, free and public disclosure of these matters involving any particular reactor. Joint Committee on Atomic Energy, S. Rep. No. 92-707, 92nd Cong. 2nd Sess. 6 (1972).

There is some support for the view that the hearing requirement does not necessarily mean a trial type hearing and it is within the discretion of the Commission to decide the nature of the hearing. *Siegel* v. *U.S.*, 400 F.2d 778. (D.C. Cir. 1968). However, Siegel may be distinguished in that the issue there was outside the jurisdiction of the agency. But, even if the agency may have the discretion to

abandon the adjudicatory hearings, it has not yet acted to do so as 10 CFR Part 2 clearly indicates. Therefore, the current practice for reviewing safety questions at the Commission's Licensing Hearings is adjudicatory.

Section 102C of NEPA does not require a particular type of hearing. The statute only states that the environmental impact statement must accompany the "existing agency's review process." As seen from 10 CFR Part 50 App. D, the Commission has properly made the environmental review an adjudicatory process after it interpreted the existing agency's review process to be adjudicatory.

Once the Commission decides (as we contend it must) that the incremental cost of the fuel cycle must be factored into the decision making process, then it follows from NEPA that it must be subject to the same adjudicatory hearing process that the Commission uses with other technical, safety, and environmental issues. In reference to an adjudicatory environmental review, the court in *Greene County, supra* at 422 noted that:

> since the [environmental impact] statement may well go to waste unless it is subject to the full scruteny of the hearing process, we [the Court] also believe that the intervenors must be given the opportunity to cross examine both PAGNY's and Commission's witnesses in light of the statement.

The Court in *Calvert Cliff's, supra,* also required the Commission to independently examine each statement on an individual basis to determine whether the staff's environmental review had been adequate.

Greene County, supra, Calvert Cliff's, supra, and the Commission's existing regulations stand for the proposition that review of the environmental effect of a nuclear project must be part of each and every licensing hearing. It follows that the environmental effects of the fuel cycle

must also be considered on a case by case basis. The Courts fully recognize that delay is incident to the mandate of NEPA. In *Greene County, supra* at 422 and *Calvert Cliff's, supra* at 1122 they said:

> Delay is a concomitant of the implemantation of the procedure prescribed by NEPA, and the spectre of a power crisis must not be used to create a blackout of environmental considerations in the agency review process.

Our proposal recognizes the delay that a repetitious consideration of the fuel cycle at every hearing would involve. Therefore the purpose of our generic hearing proposal is to replace each required adjudicatory hearing on the environmental effects of the fuel cycle in a single adjudicatory consolidated hearing.

The separation of the environmental questions into separate adjudicatory hearings was acceptable to the Court in *Greene County, supra.* There at footnote 23 the Court suggested one hearing "to gather information to aid the Commission in forming its statement" and then a second hearing, "to consider the merits of the licensing application." Our generic consolidation concept builds on the above suggestion by utilizing a single consolidated hearing to gather information and then feeding it into the local licensing hearings where the remaining environmental issues and all radiological issues will be fully explored and where alternatives will be considered and the final balance struck.

2) *Discovery*

We consider that the adjudicatory nature of AEC current licensing hearings has two essential ingredients, discovery and cross examination. We agree with the Commission's policy statement issued with its recent Part 2 revised regulations 37 FR 15127, August 28, 1972, (although not with all of the regulations or how they are being interpreted) that

proper discovery providing for production of documents, serving of interrogatories, and taking of depositions without the need of formal motions can expedite the hearing process.

There is no need for delays to result from the discovery process as occurred in ECCS when there was difficulty in obtaining discovery in the middle of the hearing. Procedural rules should be established before the hearing. Discovery should be completed before the hearing. Discovery should provide for availability of all documents that were used in the process of the preparation of the parties position. Because it is difficult to determine the position of the Staff in the Fuel Survey report, a bill of particulars expressely stating their positions should be required before discovery begins. Ideally there may be no reason for discovery against the staff as 10 CFR 2.790 (1972) contemplates the staff's position will be available thru public documents. However, this has not always occurred. Interrogatories should be used extensively to iron out issues and arrive at stipulations prior to hearing. Also pre hearing conferences should be used to prepare for an orderly hearing.

The key to an orderly hearing is to rationalize the role of the parties. There is no question that the Commission has used its vast resources on preparing its positions. At the same time there are also many capable scientists and engineers in industry and universities who have developed positions on the issues in question but who do not have vast resources at their disposal. Through discovery these scientist and engineers can get the necessary information to study the analyses, criteria and assumptions of the Commission's staff. They then can use their expertise to make a substantial contribution to the ultimate decision. The Council on Environmental Quality has noted "often indi-

viduals and groups can contribute data and insights beyond the expertise of the agency involved." *CEQ Report* 1 Env. L. Rep. 50059 (1971).

3) *Cross Examination*

It has been suggested that cross examination is not a practical method to get at the truth of technical matters. It is agreed that cross examination is not necessarily an efficient process. There are two concepts that must be weighed in establishing a hearing system, efficiency and accuracy. We are not dealing with such subjects as the labeling requirements for grocery products in our generic hearing but are dealing with the safety and environmental issues relating to a Nuclear Power System. Accuracy not efficiency must be the guideline. The Joint Committee, itself, has:

> insisted that the most meticulous attention be given to the scientific and technical problems associated with atomic energy licensing and has insisted that there be full, free and public discussion of these matters involving any particular reactor. JCAE-Senate Report 92,787, 92 Cong. 2nd Session 6 (May 19, 1972).

Cross examination serves to air views different from the final approved point of view and to explain why the final view is the approved view. No doubt without cross examination the Board may also ask these necessary questions. However, the adversary system tends to assure that the questioning will persever until the full answer requested is given. Dr. Steindler requested from the staff (TR 308) February 2, 1973, a comment on the quality of standards used by the Bureau of Mines in their assessment of both worker safety as well as evnironmental impact? After much explanation by the staff, Dr. Steindler accepted an answer that these are competent agencies and people working in this area but was not informed of the quality of work

done by these competent people. An attorney would be expected to continue asking questions until he received a definite answer.

Often pervasive cross examination is necessary to get at the basis for the position of the staff. The Board demonstrated a real need for cross examination at TR 139, February 1, 1973, where the Board noted that the Fuel Cycle Survey's underlying assumptions had not been documented. Thus the Board who must make the decision were at a loss of "how you got this" and "where you got that." The Staff commented that it did not realize that it had left our necessary references. Once again, in the absence of cross examination, the Board and members of the public did not learn of these assumptions nor were they aired in a public forum. Without these assumptions one could question how the Board can be expected to make their required evaluation of the staff's statement. It was probably for similar reasons that the Court in *Greene County, supra,* mandated cross examination when reviewing the environmental impact statements.

An alternative to cross examination may be a system where a number of experts sit down and arrive at a consensus. While under some circumstances this may be a practical system, it would not be manageable here Obviously experts like other men can reasonably differ. It has been suggested that:

> [T]he scientist seeks correct and accurate answers to problems by employing a high degree of precision in most instances, but precision does not guarantee accuracy because there are frequently intervening or overriding subjective judgements. To appreciate the difference between precision and accuracy, consider the case of the rifleman who shoots ten consecutive bull's eyes into the wrong target. Precise yes; accurate no.

Nickerson, *the Expert Technical Witness,* 50 A.B.A. Journal 731 (1969).

It is widely known that the Commission has two roles — promotion and regulation. The roles are not consistent and produce substantially different conclusions from the same facts. For instance note the divergence of views between Drs. Rosen and Colmar and Dr. Hannauer at the EEC Hearings. For an expert consensus system you would not only need a number of experts with different points of view but they must begin from the same assumptions. If they have and maintain different assumptions, they will never reach a consensus.

The consensus system is not a new idea. It was the subject of extensive debate by professors Davis and Cavers in 1962.[4] Professor Caver preferred an open adjudicatory hearing and professor Davis preferred a management executive style review. Professor Murphy, a former ASLB member, notes that executive decisions are fallible. "Ford did, after all produce the Esdel by executive decision."[5]

4) *Conclusion*

The Commission has in the past held generic rulemaking hearings. Both "The Lowas Practicable" and "ECCS" hearings made use of discovery and cross examination.[6]

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[4] Cavers, *Administrative Decision Making in Nuclear Facilities Licensing,* 110 U. Pa. L. Rev. 330 (1962); Davis, *Nuclear Facilities Licensing: Another View, id.* at 371; Cavers, *Nuclear Facilities Licensing: A Word More, id. at* 389

[5] Murphy, *NEPA and the Licensing Process: Environmental Magna Carta or Agency Corp. de grace,* 12 Colum. L. Rev. 963 (1972).

[6] The hearing was a *quasi* adjuciatory hearing. Perhaps such a quasi hearing was permissible there (although we doubt it) it certainly is not permissible here. There must be a fuel adjudicatory hearing.

Our proposal, therefore it is not new. We are only proposing that the generic hearing have concrete guidelines before the hearings starts for discovery and cross examination. As noted previously, the Commission has the authority to establish an orderly procedure. The Commission is not interested and neither are we on who makes the best showing but in ascertaining the truth. Obviously where no purpose is served by cross examination it should be limited. Thus the needless delay and even worse the friction between the parties, which occurs as each issue becomes subject to debate during the hearing on whether discovery and cross examination will be allowed will not occur.

The goal of this proceeding is not to design a system that defines the issues as "legislative", "a adjudicatory," "factual" or "judgemental" but to design a system that permits the parties to make contributions to the resolution of licensing issues.

It may be that the Commission will be tempted to choose adjudicatory hearing and reverse the precedents of the use of discovery and cross examination in generic style hearings. It is our judgment that putting reliance on industry and the staff rather than publicly airing competing points of view is contrary to the purpose of the § 189a hearing:

> to facilitate safety determinations and enhance public confidence in the regulatory process. JCAE, House Report No. 1966 87th Cong. 2nd Session, p. 6 July 5, 1962.

CERTIFICATE OF SERVICE

I hereby certify that a copy of these comments was mailed, postage prepaid this 2nd day of March, 1973, to all persons included on the Service List for this Proceeding.

ANTHONY Z. ROISMAN

STAFF SUMMARY COMMENTS ON PROCEEDING FOR ENVIRONMENTAL EFFECTS OF THE URANIUM FUEL CYCLE, pp. 43-53

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FUEL REPROCESSING

Response to Dr. Geyer's question for types of problems encountered in the Hanford Reprocessing Plants.[21]

The Battelle-Pacific Northwest Laboratories has responsibility to sample and obtain analyses of environmentally important interactions with the Hanford plant. Analyses are performed not only by Battelle, but also by U.S. Testing Company and by the Hanford Environmental Health Foundation, all located at Richmond, Washington. This program of sampling and analysis is designed to demonstrate compliance with various standards, including:

- AEC Manual Chapter 0524 (release limits, Concentration Guides and Population Dose Criteria)
- Federal Air Quality Standards
- Washington State Water Quality Standards,

and to detect any impact of Hanford disposal practices. Both radioactive and nonradioactive chemical analyses are performed.

The most significant Hanford contributions to off-plant radioactivity and population doses have, in recent years, originated with reactor once-through cooling water released to the Columbia River. Beginning in 1971 only one produtions reactor, N, remains in operation. It has a closed primary cooling loop and releases only minor quantities of radioactivity to the river. Thus, the 1971 Hanford Surveillance Program shows the impact of other Hanford operations on the environment. These operations included the

Purex chemical reprocessing plant, fuel fabrication for N reactor, plutonium processing and scrap recovery, and laboratory operations.

Data presented in BNWL-1688, the 1971 Hanford Surveillance Program, shows conclusively that since shutdown of the once-through cooled production reactors, radioactivity released to the environs at Hanford has been reduced to negligible levels. No unusual releases occurred in 1971 causing Concentration Guides, as given in AEC Manual Chapter 0524, Appendix, Table II, to be exceeded. All measurements of radioactivity were less than 15% of the applicable Concentration Guides. Radiation dose estimates for population groups in the plant environs for 1971 were all less than 1% of applicable standards for plant operations. Offsite measurements of other air and water quality parameters were also well within applicable criteria and showed no significant evidence of plant operations.

Highlights of the observations included:

- Little, if any, measureable effect on Columbia River quality was detectable from wastes released to ground disposal sites within the Hanford plant boundaries.
- Generally, the average airborne radioactivity concentrations at the Hanford boundary were the same as the more distant sampling locations, indicating that Hanford operations were not contributing significantly to offsite airborne radioactivity.
- Average I-131 concentrations in milk locally available were less than 0.5% of the Concentration Guides for water. Increases of I-131 noted in milk for the latter part of 1971 are attributed to atmospheric nuclear weapons testing.
- Cs-137 and Sr-90 were detectable in milk locally available, but concentrations were less than samples ob-

tained from the Puget Sound area — an area of high rainfall; since Richland has a desert climate, the activity is attributed to fall-out.

- Zn-65 activity (250 days half-life) was higher in local farm food-stuffs than commercial foodstuffs and can be attributed to residual activity in irrigation waters resulting from previous reactor operations; however, fallout Sr-90, Cs-137, Ce Pr-144, Zr Nb-95 and Ru-106 activities were higher in commercial foodstuffs than in local farm foodstuffs.
- Plutonium concentrations in soil and vegetation were typical of general regional levels for the arid western states.

Response to CNI/UCS representative's statements about Contamination by Savannah River Facilities and the Skin Dose from Krypton from Barnwell Nuclear Fuel Plant.[22]

Annual reports summarize the results obtained from Environmental Monitoring in the Vicinity of the Savannah River Plant. In the past these reports were issued semi-annually and were entitled "Effect of the Savannah River Plant on Environmental Radioactivity." A continuous monitoring program has been maintained since 1951 (before plant startup) to determine the concentrations of radioactive materials in a 1200 square mile area outside the Savannah River Plant. The quantity of radioactivity released by SRP to its environs is, for the most part, too small to be distinguished from natural background radiation and fallout from worldwide nuclear weapon tests, and environmental levels continue to be far below levels considered significant from a public health viewpoint.

Prospective dose commitments to individuals at the BNFP site boundary from exposure to krypton-85 are:

	mrem/yr.
To surface of skin	21.5
To live skin tissue	11.2
To whole-body	0.28

These dose commitments would result from exposure (continuous for one year) at the location at the site's boundary which would give the maximum exposure to the BNFP stack effluent. These values are not corrected for occupancy factors nor shielding afforded by structures, and represent the maximum annual doses when the BNFP is operating at its designed capacity.

S. H. Smiley also addressed this subject on p. 316 of the transcript and gave the live skin tissue dose.

Response to AIF Comments about I-131/I-129 ratio[18]

Table F-5 in the survey is not in error. The ratio of 10 for I-131/I-129 is the result of applying different decontamination factors to their removal. A lower DF is used for I-129 (we used 600 here) to account for the possible "sneak" iodine which could escape from waste storage or other waste treatment. This information is contained in our backup data. A note to the table will be added to indicate that different decontamination factors are used to arrive at the release figures shown.

Answers to EPA Comments[14]

Iodine Removal Technology

AEC does not agree that iodine removal technology is unproven. The Final Detailed Environmental Statement for the MFRP gives expected release rates for I-131 and I-129 which are 0.1% of the annual inventory of iodine processed. The release rate for I-131 used in the survey is also 0.1% of the processed inventory. The I-129 release

rate was biased upward as described in the preceding paragraph.

Criticality Incident

10^{18} fissions for a criticality is consistent with the Final Detailed Environmental Statement for MFRP. There has never been a criticality accident in a low-enriched uranium fuel cycle facility to date (March 1973).

Low Level Waste

The data on low level waste representing fuel element hulls and other fuel element parts are site independent. The data given in Table F-6 of ES for laboratory waste, small tools, etc. have a wide range (190-1000 cu. ft.) so that any variation between NFS and BNFP operations should be able to be accommodated within that range. The volume of low level laboratory waste, gloves, etc. is a strong function of the way the waste is compacted and packaged.

Concentrations of Radionuclides in NFS Effluents

The following table indicates the NFS experience for the past five years, with respect to concentrations of radioactivity in the liquid effluent to Cattaraugus Creek.

% MPC Measured in Cattaraugus Creek

Year	Max. for One Month	Average for Yr.
1972*	11.0	5.8
1971	n1.2	13.2
1970	49.7	21.9
1969	32.7	19.7
1968**	16.5	10.0

*Through September 1972, later data not yet available.
**Period April-December, 1968
MPC (β) = 3. x 10^{-7} μCi/ml for Sr^{90}
MPC (β) = 1. x 10^{-5} μc/ml for β exclusive of SR^{90}
MPC (α) = 5 x 10^{-6} μci/ml

The effect of operation of the new low level waste treatment system can be seen in the later year's data.

Response to CNI/UCS Statement about I-129[23]

Because of its low specific activity (1.7 x 10^{-4} Ci/gm) I-129 does not have a serious impact on the environment at the present (Dr. Radford of CNI/UCS accepts this statement). Iodine-129 *was* considered by NFS and the AEC staff has considered the release of I-129 throughout the review and has applied Technical Specifications related to obtaining as low as practicable levels to its release.

Kr-85[24]

Several people have commented about Kr 85 releases given in the report.

The report gives a value for the annual man rem to the northern hemisphere from the release of all Kr-85 from a 1000 MWe reactor over a 20 year period as 80 man rem. If the commitment of 1000 MWe load to a nuclear station were assumed to be a perpetual commitment, the equilibrium exposure to the northern hemisphere from all of the Kr-85 formed in the perpetual production of 1000 MWe would be 120 man rem/yr based on the model 1000 MWe reactor. These values compare with 500 million man rem/year from natural background. Any realistic estimate of installed nuclear power by the year 2000, when multiplied by 120 man rem/year per 1000 MWe, the equilibrium Kr-85 exposure, still yields an insignificant increase over annual background.

It is not the position of the AEC, however, that Kr-85 may continue to be released forever to the atmosphere. There is ongoing research devoted to developing a method for removing Kr-85 from reprocessing plant off-gases.

New York State Comments[25]

New York State Department of Environmental Conservation has commented on the presence of isotopes other than Ru-106 and H-3 in NFS liquid effluents.

Data prior to the installation of improved low level waste systems at NFS are of little but historical value. Stream concentration data for periods toward the end of 1971 show improvement over earlier years.

In considering future releases of radioisotopes from NFS in liquid effluents, the Staff assumed that 10 CFR 20 values would be reached at the waste lagoon discharge for Cs and Sr. Accounting for creek dilution, values offsite would be less than 0.1% of MPC. It is considered by the Staff that Ru-106 and H-3 cannot be removed to the same extent as Cs and Sr. Hence values were assigned for those isotopes.

New York State is correct in that no proof has been introduced that Cattaraugus Creek is not a potential source for drinking water, just as any stream might be a drinking water source. However, it is correct to state that Cattaraugus Creek is not currently a source of drinking water.

Accident Analyses

MPCA has asked for additional data on accidents.[8]

The AEC has prepared a Final Detailed Environmental Statement for the GE Reprocessing Plant at Morris, Illinois and a Draft Detailed Environmental Statement for the Allied-Gulf Reprocessing Plant at Barnwell, South Carolina. Details of accident analyses can be found in these documents or the respective Safety Analysis Reports.

WASTE DISPOSAL

Additions and Corrections to Testimony of Dr. Frank K. Pittman Transcript, page 203, lines 20-25

The waste resulting from reprocessing nuclear fuel in the year 2000 AD is estimated to be contained in approximately 8,000 waste cans (typically 1 ft. diameter by 10 ft. long). Assuming this waste is stored at the reprocessing plant for 10 years, the waste would be received at a Federal repository in about 630 shipments during the year 2010 AD.

Transcript, page 204, lines 12-13

Assuming no technological changes in the methods of power generation or improvements in nuclear waste concentration or reprocessing methods, between 2000 AD and 2025 AD, the estimated number of shipments of "typical" waste containers to be received at a Federal repository in the year 2000 AD (~25 years hence) is about 260 shipments per year and for the year 2025 AD (~50 years hence) about 1250 shipments per year.

The estimated number of annual shipments (assuming 12 "typical" waste cans per shipment) are given for the following years:

Year	Estimated Annual Shipments Received at Federal Repository
1985	20
1990	70
1995	140
2000	260
2005	420
2010	630
2025	1250

Other-Than-High-Level Wastes

EPA[14] and MPCA[8] have commented on other-than-high-level waste in the form or reactor generated material. Other than high level reactor waste (e.g., circulating crud. IX resin) is not a part of this survey since it is covered in individual reactor statements. It is not felt that residual activation products on or in reactor fuel assembly cladding effectively changes the character or amount of radioactive materials in the reprocessing plant.

High Level Wastes

The AIF has pointed out a typographical error in the survey.[18] The value given on page G-10 of the ES should be 10,000 gallons of radioactive liquid waste.

IN THE MATTER OF

AMENDMENT OF 10 CFR PART 50-LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

(Environmental Effects of the Uranium Fuel Cycle)

Docket RM 50-3

SUPPLEMENTARY COMMENTS BY THE UNION OF CONCERNED SCIENTISTS ON "ENVIRONMENTAL SURVEY OF THE NUCLEAR FUEL CYCLE"

The enclosed comments on 1. the storage and disposal of high-level radioactive wastes; and 2. the operations of the fuel reprocessing plant located in Ashford, New York, operated by Nuclear Fuel Services, Inc., are being filed with the Atomic Energy Commission in behalf of the Consolidated National Intervenors by the Union of Concerned Scientists as part of its testimony in the rulemaking hearing (Docket RM 50-3) held in Washington on February 1, 1973.

INTRODUCTION

The following chapters specifically address two important areas of major public concern. Both of these topics are treated, albeit briefly, in the document *Environmental Survey of the Nuclear Fuel Cycle* (ESNFC) and are recognized by the Atomic Energy Commission as being important parts of the fuel cycle whose costs and benefits are to be determined as accurately as possible for use in the licensing of nuclear power plants.

The treatment of the following discussions is limited solely to the radiological effects of fuel reprocessing and waste storage. Although there are additional environmental impacts in the form of land use, chemical effluents, and thermal pollution, it is clear that the unique hazards of public concern — whose costs are especially to be evaluated — arise from the presence of enormous amounts of radioactivity.

FUEL REPROCESSING

At this time there is extensive experience with only one reprocessing plant in the United States, located near West Valley, New York. The description of the experience with this plant, as presented in the ESNFC, is deficient in evaluating the radiological and environmental effects, including those on wildlife, from the recorded radiological emissions. Much of this problem stems from the lack of adequate surveillance and monitoring in the environs of the plant. These issues are explored in depth in chapter 3 of this report with appropriate recommendations for reducing emissions and providing an adequate monitoring program in the future. It is clear from chapter 3, however, that the environmental costs of the operations of the NFS reprocessing facility have been underestimated by the AEC.

WASTE STORAGE

One of the most important issues facing the use of nuclear energy today is the problem of ultimate disposal of highly radioactive wastes. If this problem continues to remain unsolved, as it surely is today, one would have to conclude that the environmental and social costs of using nuclear energy are so great as to be prohibitive. Yet the treatment of this immensely important topic in ESNFC is superficial and inadequate. For example, there is an *exclusive* description of radioactive wastes in chapter G in

units of cubic-feet, as though high-level wastes were so much sand or gravel. Such a description, without a further elaboration of the potential impact of a cubic-foot of wastes, is misleading and useless. In addition, Chapter G of ESNFC, on waste storage, is replete with bland reassurances that problems can be solved even though the full extent and seriousness of these problems are not presented and explored. Consider the following statement: ". . . the Federal government plans to provide an engineered structure facility for interim storage of high-level wastes. This interim facility will be designed with capability for storage of wastes for a 100-year period." (p G-2). No further elaboration is given. Later, ". . . The engineered facility will be designed so that solid high-level wastes can be stored without danger to the health and safety of man and with no unacceptable impact on the environment." (p G-11). Little can be said about such an all encompassing statement.

In Chapter 2 of this report the full environmental implications of the waste storage problem are explored. Various proposals are reviewed and recommendations are presented for urgently needed research. As with fuel reprocessing, one can only conclude that the social and biological costs of accepting the hazards of storing high level wastes forever have been grossly underestimated by the AEC.

The following chapters of this report have been prepared by Prof. Thomas Hollocher, Department of Biochemistry, Brandeis University, and Philip M. Hatfield, M.D., Lahey Clinic Foundation, Inc., Boston.

In oral testimony at the AEC hearing on Environmental Effects of the Nuclear Fuel Cycle, UCS emphasized that it was particularly important to assess, at once, full environ-

mental impact of all operations associated with radioactivity and nuclear fision. Especially UCS emphasized the importance of considering the question of catastrophic accidents in nuclear reactor operation. The importance was stressed of setting out the probability and consequences of such accidents and comparisons with the assurances that have been made public by the reactor vendors, the AEC, and the utilities. In oral testimony UCS stated its position concerning accident probabilities and consequences based on its own analysis and on its participation in the ECCS hearings. We wish to emphasize the importance we attach to having the Environmental Survey include this material. In no other way can the impact of the nuclear program be adequately assessed. UCS established in its oral testimony the great present risks borne by the American public owing to the very grave deficiencies in the regulatory reviews of reactor safety and the consequent dwindling and vanishing of necessary margins of safety.

There is no mention in the Environmental Survey of the special risks and problems associated with the recently announced reactors which will float at sea. UCS has given oral testimony to a sub-committee of Senator Warren Magnuson's Senate Commerce Committee, under Senator Hollings, February 1, 1973. The risks include not only extra difficulties in the case of catastrophic accident but also new difficulties in the transportation of irradiated fuel. This latter subject is not treated adequately in the AEC's Environmental Summary of November 1972.

STORAGE AND DISPOSAL OF HIGH LEVEL WASTES

I SUMMARY AND RECOMMENDATIONS .....

II HIGH LEVEL RADIOACTIVE WASTES AND THEIR DECAY CHARACTERISTICS .....

III GROWTH OF NUCLEAR POWER .....

IV INTERMEDIATE AND LOW LEVEL WASTES ..

V EXPERIENCE WITH WASTES FROM NUCLEAR WEAPONS PRODUCTION .....

VI STORAGE/DISPOSAL PLANS IN THE NUCLEAR POWER INDUSTRY .....

1. Short term storage for thermal decay .....
2. Disposal in solar orbit .....
3. Transmutation and fission of transuranic actinides
4. Deposition in oceanic trenches .....
5. Disposal in Antarctica .....
6. Desposition in underground caverns created by the detonation of nuclear devices .....
7. Burial in ancient bedded salt formations or dry rock at intermediate depths .....
8. Deep burial .....
9. Injection of wastes in liquid form into wells .....
10. Long term storage in surface structures .....

TABLE I .....

TABLE II .....

TABLE III .....

LEGENDS TO FIGURES .....

FIGURE I .....

FIGURE II .....

FIGURE III .....

I SUMMARY AND RECOMMENDATIONS

Except for the storage of liquid wastes in tanks, for which experience from weapons production applies, all proposals for long term storage or disposal of high level waste from the nuclear power industry lie at the research and development stage. The proposals so far considered seriously by the AEC for the disposal of wastes are dubious in concept (caverns excavated by nuclear weapons, depositing wastes in liquid form in rock caverns), not technically feasible (disposal in solar orbit), or they are so dependent upon site specific geological characteristics that suitability cannot be determined *a priori* without extensive on site investigation (disposal in bedded salt or under Antarctic ice). One such site, the salt beds at Lyons, Kansas, was studied carefully for several years in the 1960s and was finally adjudged unsuitable. The matter of man-made vaults at or near the surface for long term storage (500 years) is equally uncertain. Their maintenance depends upon the existence of social and political institutions, the permanence of which cannot be guaranteed over time.

The impression is inescapable, in view of the present imprecise state of affairs, that no convincing statements exist regarding the long term environmental impact attending the storage and/or disposal of wastes from fuel reprocessing. It is disturbing in this regard that the pace of development of a suitable waste disposal technology does not seem commensurate with the rate of expansion of the nuclear power industry. This situation is reminscent of developments attending the production of plutonium for the weapons program: Hasty and, in part, seriously incorrect decisions were made regarding the storage of wastes produced by a technology alleged to be urgently necessary.

The times during which radioactive wastes must remain secure from the biosphere have no parallel in human affairs.

Eight hundred years are required for fission products alone and millions of years if the fission products continue to be contaminated with transuranic elements at present levels. Fission technology requires that man issue guarantees on events far into the future, and it is not clear in most cases how this can be done. Institutional arrangements do not exist and never have existed to guarantee the monitoring of or attendance upon storage facilities over a millennium. In the range of a million years, serious geological uncertainties arise and even the survival of man may be doubtful. "In perpetuity" has little real meaning in human affairs.

The uncertain state of affairs in high level waste disposal was well summarized in 1972 by F. K. Pittman, director, Division of Management and Transportation, U.S.A.E.C.:

> "While none of the suggested long-term solutions to the problem of permanent disposal of high-level radioactive waste is technically or economically feasible today, the AEC recognizes that one or more may well offer attractive options in the future." (21)

It is interesting to note that AEC regulation now stipulates that high level wastes are to be solidified after 5 years storage and shipped to a Federal repository within 10 years. The repository does not now exist and may not exist for some time. In the meanwhile, billions of Curies from commercial power production will join the accumulated several billion Curies of weapons waste — all of it at the earth's surface and vulnerable to accident, error, or sabotage.

It is probably advisable, given the scale of anticipated nuclear operations, to increase the budget for research and development in waste management. Through the 1960s to 1971, the AEC budget for this category was about $5 million/year. Of that, about $1½ million/year went to salt disposal, specifically the Lyons, Kansas project, about $2 million/year was committed to waste solidification tech-

nology, and about $2.5 million/year has been used to develop a rock cavern disposal scheme for the Savannah River plant. This $5 million can be compared with a total yearly waste management budget in the AEC of about $35 million, most of which goes to management of weapons wastes. For orientation, the entire AEC budget is of the order of $3 billion/year.

RECOMMENDATIONS

1. The chemistry of fuel reprocessing should be improved to separate almost totally the long-lived transuranium elements and other actinides from fission products. Levels of actinides should be reduced by 10-fold for some, and 100-fold for others relative to present levels in the reprocessing waste stream. The extraction of U, Np, and Pu should be 99.95% complete and that of Am and higher actinides should be 99% complete. This will result in increases in the cost of fuel reprocessing and, together with Recommendation 2 below, lead to an increase of about 2-3% in the cost of delivered nuclear power. At present, for comparison, the only actinides recovered are U and Pu, both at the 99.5% level.

Similar improvements should be made also in cleaning up fuel cladding hulls and α wastes from fuel fabrication.

2. Recovered transuranic elements should be disposed of through their transmutation and fission, preferably in fast neutron reactors. This would diminish the time of hazard for the remaining fission products to something of the order of 800 years, as opposed to millions of years otherwise.

3. The remaining fission products should be solidified in a time as short as is consistent with radiogenic heat production, and certainly no greater than 5 years, and be placed, as soon as is practicable and safe, in carefully selected geological formations. The possibility that solidification can immediately follow reprocessing of fuel should be vigorously pursued, for this would eliminate interim tank storage of liquid wastes.

4. Long term (>50 years) storage of fission products in surface or near surface facilities should not be undertaken.

5. Disposal plans which are attractive in principle but at present unfeasible (disposal in solar orbit) or in need of further study (disposal under the Antarctic ice cap) should be reviewed periodically in light of relevant technological developments or new data.

6. In light of the impending need for a Federal waste repository, a greatly increased research and development effort toward that end should be undertaken by the AEC and the relevant industrial authorities. A detailed plan for the disposal of high-level wastes through 2000-2010 A.D. ought to appear within the next few years.

II HIGH LEVEL RADIOACTIVE WASTES AND THEIR DECAY CHARACTERISTICS

During the operations of a reactor, two main types of radioactive products accumulate in the fuel: fission products and actinides, the most abundant of which are the transuranium elements. Actinides are the series of elements Ac, Th, Pa, U, and the transuranium elements starting with Np, Pu, Am and Cm. Fission products, as the name implies, are the products of the fission of ^{235}U and, to some extent in light water reactors, of ^{239}Pu and ^{241}Pu, and have mass numbers in the range 8-155. The transuranic elements are built up by neutron capture, starting with ^{238}U, and include fissionable and fertile isotopes of Pu which are of value as nuclear fuel. The transuranic elements of major importance here have mass numbers from 237-244.

In irradiating enriched uranium fuel in a light water reactor to the level of 33×10^9 watt-days per metric ton fuel, about 33 kg of U is consumed (converted to fission products) per metric ton and there is present at the end 8-9 kg of Pu and about 1 kg of other transuranic actinides, most of which is Np.[1]

During fuel reprocessing the fission products are separated, and uranium and plutonium are recovered. The separations are not quite total under present chemistry (Purex and related processes) and about 0.5% of the Pu and U and most of the other actinides appear with the fission products in the final aqueous waste stream. Typical values for the yields of fission products and transuranic elements in the reprocessing waste stream are given in Tables I and II, respectively. In addition, about 0.1% of the Pu remains with the fuel cladding hulls. Some also appear as α wastes in fuel fabrication.

It is clear that both the short lived products ($t_{1/2} < 1$ year) and the very long lived isotopes ($t_{1/2} > 10^7$ years) are of little concern in the context of long term storage and disposal. The former decay largely within the period of thermal cooling of 3 to 5 years which can be considered temporary storage; the latter decay so slowly that they exhibit low specific activities and rather low radiological hazards. ^{129}I ($t_{1/2} = 1.7 \times 10^7$ years), for example, has a specific activity of only 0.16 mCi/g and would not represent a major biological hazard even to thyroid tissue if it were diluted with stable iodine to the level of 1 part in 10^5 - 10^6 (2). In Tables I and II, therefore, we have considered only products with half-lives > 1 year and (except for ^{129}I) < 10^7 years.

The high initial radioactivity of fission products is occasioned by short-lived isotopes. If total decay energy of fission products at age 1 day were taken as 100, then the value would drop to 10 at 100 days, to 1 at about 900 days, to 0.3

at 10 years, and to 0.1 at about 41 years (3). At 5 years, the total decay energy is only about twice that for ^{90}Sr and ^{137}Cs combined, and, as seen in Table I, these two isotopes contribute the bulk of the decay energy at ten years. By 500 years, the decay energy has dropped another 4 orders of magnitude relative to that at 10 years and is now dominated by ^{151}Sm. A further factor of decrease of about 2 is realized by 1000 years at which time ^{93}Zr, ^{99}Tc, and ^{135}Cs dominate. Thereafter decay is very slow and is governed by isotopes with half lives > 2×10^5 years. In summary, fission product decay energy drops by a factor of several million after 800 years relative to the value at 1 day.

While fission products are not without hazard after 800 years, the relative toxicity is only about 50 times that of a similar volume of natural uranium ore containing 1.4% U_3O_8, by weight (4).

We define relative toxicity at different times according to the approach of Kubo and Rose (4). For each radioactive species, a water dilution factor is computed so that the species would be present at no more than the maximum permissible concentration set by national standards. The dilution factors, summed over all the species, are then compared with the dilution factor for uranium ore of the above type, which serves as a nonzero but commonly encountered source of radioactive isotopes in the lithosphere. The reprocessing wastes are assumed to be solidified at 1 ft^3 per 10×10^9 watt-day (thermal) operation of the reactor. This approach takes into account both the direct radiological hazards and the biological factors, such as body turnover and organ specific sequestration, that are believed to apply in men. It does not consider more complicated factors, such as concentration mechanisms which often apply to isotopes as they pass through a series of ecological food chains.

The problem with the transuranic elements is more difficult. Elements of the group decay by α and/or β emission through numerous steps into other radioactive daughter elements (e.g., ^{244}Cm into ^{240}Pu); and they have generally very high biological toxicity by virtue of α emission and biological sequestration. Three disintegration processes are of importance in Table II:

$$\text{Cm-244} \xrightarrow[\alpha]{17.6\text{ yr.}} \text{Pu-240} \xrightarrow[\alpha]{6580\text{ yr.}} \text{U-236}$$

$$\text{Am-243} \xrightarrow[\alpha]{7370\text{ yr.}} \text{Pu-239} \xrightarrow[\beta-]{2.35\text{ day}} \text{Np-239} \xrightarrow[\alpha]{24400\text{ yr.}} \text{U-235}$$

$$\text{Pu-241} \xrightarrow[\beta-]{13.2\text{ yr.}} \text{Am-241} \xrightarrow[\alpha]{462\text{ yr.}} \text{Np-237} \xrightarrow[\alpha]{2.2.10^6\text{ yr.}} \text{Pr-233}$$

The second series of decays generates Pu-239 and is particularly relevant to very long term storage. One decay path of long term interest not shown in Table II is the decay of Pu-238 into U-234 which itself has a half life of ¼ million years.

Plutonium (Pu) is perhaps the most toxic element known and represents a chronic biological hazard on a weight basis comparable to the acute hazard from *botulinus* toxin, i.e., it is hazardous at 10^{-6}g, if appropriately deposited in lungs or bone (5). ^{239}Pu in equilibrium with its daughters has a direct radiological hazard about 10,000 times that of natural uranium in equilibrium with its daughters (6). Pu exhibits, in addition, a very large biological concentration factor with little turnover in bony tissues. The yields of ^{239}Pu and ^{240}Pu from one metric ton of fuel in Table II represent together about 70g of Pu after 500 years storage. It is clear that the presence of current levels of transuranic elements alone in the waste stream will require that the wastes be secured from the biosphere for very long periods.

The period of hazard for the waste actinides is determined in the long term by the properties of the radioactive daughters. The decay energies of the actinides and their daughters decrease with time and become equal to those of fission products after a few hundred years, as shown in Fig. 1. Thereafter the actinides dominate. The relative toxicities of the decay daughters tend, however, to be somewhat greater than the parent actinides (4). As seen in Fig. 2, the relative toxicity goes through a minimum at about 2×10^4 years and then increases about 7 fold and reaches a maximum at about 7×10^5 years. Relative toxicity remains more than 1000 times that of uranium ore over most of 4×10^6 years.

III GROWTH OF NUCLEAR POWER

An example of a projection on the growth of the nuclear power industry in the U.S. is given in Table III. Various projections have been made and, while some disagreement is noted, the projections generally agree within a factor of about 2 (1, 6, 7, 8).

It seems likely that 700-1000 reactors will be in operation by the year 2000, each with an output of about 1 Gw(e) (1,000 megawatts) or 8000 Gw-hrs (e)/yr. This is a level of about 140 times the output of the present nuclear power industry. Each reactor will generate 5-8 metric tons of solidified high level waste per year at steady-state to yield in total about 5000 metric tons of waste per year. Accumulated wastes will be about 25,000 metric tons by the year 2000, or, if left as aqueous liquid waste, 40-60 million gallons. Accumulated radioactivity has been estimated to lie in the range of 200 billion Ci, with about 30 billion Ci residing in high level waste which has aged for 5-10 years. The accumulated ^{239}Pu alone would amount to about 24 metric

tons total in the waste. The capital investment for the plants alone is estimated to be about $300 billion. Sales of nuclear-generated electricity at 8-9 mills/kw-hr. will result in a $60-70 billion/yr. industry.

IV INTERMEDIATE AND LOW LEVEL WASTES

A second class of nuclear waste exists which contains radioactivity at much lower levels — the so-called low and intermediate level wastes (1, 7, 9). These are comprised largely of solutions and materials which have become contaminated with various but generally small amounts of fission products and/or transuranic elements as the result of processes or accidents within the nuclear industry. An important source of these wastes in the power industry will be the fuel cladding hulls which contain activitation elements and some residual Pu. The problem of disposal of low and intermediate level wastes lies not so much in the amounts of radioactivity, which are small compared to those arising directly from fuel reprocessing, but rather in their large volume and varied form.

Low and intermediate level wastes have been disposed of variously since the onset of nuclear weapons production: direct release to surface waters or discharge into the ground by seepage in the case of aqueous solutions; shallow burial of solids in both recoverable and nonrecoverable forms. The chief problems concern the reduction of bulk, which, for some material, can be accomplished by combustion and fluxing of the solid residue at high temperatures.

While not perhaps a major problem, it is clear that a large nuclear power industry could deposit potentially large and serious amounts of radioactive materials in low and intermediate wastes. It is important that the disposal

of these wastes be very carefully considered. Some lower level wastes can be reduced in volume and ultimately added to high level wastes for long term storage or disposal. For other materials, separate disposal facilities may be in order. Fuel cladding hulls may represent a special problem in the long run. About 1/6 of the unrecovered Pu (8-9g Pu per metric ton of fuel reprocessed) remains with the hulls (1, 7). It may prove advisable or necessary to make the recovery of transuranic elements from the hulls nearly complete.

V EXPERIENCE WITH WASTES FROM NUCLEAR WEAPONS PRODUCTION

Since the inception of the nuclear weapons program during World War II man has had to deal with the problem of handling and storing high level nuclear wastes. We now have in storage from the weapons program about 90 million gallons of liquid waste and an accumulated total of several billion Ci of fission products (9). The material must be considered to be under temporary storage. In retrospect, it is now clear that mistakes were made early in the technology of storage of high level wastes arising from the weapons program. It is interesting that the mistakes were occasioned, in part at least, by the fact that hasty decisions and shortcuts were forced by what seemed to be the overriding national need for bomb-quality plutonium. It is not necessarily true that all facets of a new technology can be forced into efficient operation at the same rate. The lessons learned as the result of weapons technology should be carefully applied in the nuclear power industry.

High level fission products from fuel reprocessing are thermally hot initially and are stored temporarily in water which is cooled either by refluxing or by refrigeration.

The products partly dissolve and partly form slurries depending on their solution chemistries and ph. After 3 to 5 years, the rate of heat production has dropped to the point where the water can be removed and other long term storage or disposal strategies can be considered.

The bulk of wastes from nuclear weapons production are stored as neutral or alkaline solutions/slurries in underground carbon steel tanks, with lesser amounts stored as acid solutions in stainless steel tanks, especially at the Idaho Chemical Processing Plant. The Hanford, Washington, and the Savannah River, S.C. facilities house, between them, most of the high level liquid wastes (1, 9).

The approximately 90 million gallons of waste are stored in some 200 tanks with capacities between 0.3 and 1.3 million gallons, encased in concrete and surrounded by earth under shallow burial. The capital costs for the tanks range between $.50/gallon for 1.3 million gallon carbon steel tanks without cooling facilities, to $5.40/gallon for 0.3 million gallon stainless steel tanks with cooling coils and agitators (1).

While the tanks had life expectancies in excess of 50 years, the combination of heat, radiation, high salt concentrations, and mechanical stresses (especially at welds) has resulted in tank failures and unexpectedly short operational lives. As of 1970, 15 tank failures had been reported, all in carbon steel tanks at Hanford and Savannah River (1). The 11 failures at Hanford have released an estimated 140,000 Ci of mainly ^{137}Cs to the ground beneath the tanks. The bulk of this activity is believed to be retained by the soil 3-5 m below the tanks. A total of 4 lesser failures have occurred at Savannah River. In addition, one release was reported at Savannah River involving about 2000 Ci of ^{137}Cs during an accident in a transfer operation. The waste

was released into a sewer and thence partly into a connecting stream. No leaks have been reported in the stainless steel tanks at the Idaho plant over 16 years, but severe pitting and weld corrosion has been noted.

In the case of tank damage, the remaining contents are pumped to another tank and the damaged tank is withdrawn from operation or sealed. Stainless steel tanks can be stripped of residual solids and scale by acid washes, and therefore can be largely decontaminated. Carbon steel cannot easily be cleaned be acid with which it reacts. Thus, satisfactory methods may not exist for removing solids and scale completely from carbon steel tanks for decontamination. A combination of materials scarcity and cost resulted in the construction of most tanks from carbon steel rather than from stainless steel. This is in retrospect a serious mistake involving considerable hazard and additional major costs which have yet to be evaluated.

The total AEC waste management budget in the 1970s, exclusive of research and development programs, has been running about $35 million per year. The management of nuclear weapons wastes now stored in tanks may in the long run cost an additional $1 billion.

Programs are now underway, but have not proceeded very far, to convert weapons waste from liquid form to other forms and thus to phase out tank storage. At Hanford, the main heat producing isotopes, ^{90}Sr and ^{137}Cs, are being stripped out, encapsulated, and stored under water. The remaining wastes are then concentrated or solidified to salt cake. This program is connected to another proposal to deposit the salt cake or dense slurry into caverns in the basalt underlying the site. Environmental objections to this plan have been major and its future is very much in

doubt (10). A similar plan to deposit dense slurries in the gneiss and sedimentary formations under the Savannah River plant has been under study since 1960. At the Idaho plant, wastes are being calcined to granular solids and stored in stainless steel bins in underground concrete vaults to await final disposal. Of about 4 million gallons of liquid waste generated at the Idaho plant, about 2 million gallons have been converted to solid form over the past ten years.

VI STORAGE/DISPOSAL PLANS IN THE NUCLEAR POWER INDUSTRY

Within a decade, accumulated wastes from nuclear power generation will be in the billion Ci range and reach tens of billions of Ci by the turn of the century. It is clear that indefinite tank storage is unsatisfactory and expensive; on the other hand, proposals for alternate long term storage programs and for permanent disposal methods are still in the research and development state. Waste storage and disposal represent certainly two of the most crucial problems facing the nuclear power industry. Incorrect decisions in this decade could lead to enormous expenses in the next two decades and possibly even to a crippling of the nuclear power industry.

The billions of Ci of high level wastes expected over the next 30 years must not under any circumstances be released into the biosphere. At present only three disposal options seem open: a) the wastes may be removed from the earth, b) they may be contained on or in the earth for sufficient periods — 800 years for fission products and million of years for transuranic actinides — and, c) the transuranium actinides may be transmuted to fissionable isotopes and destroyed by fission. In the following we shall evaluate these various proposals for storage and/or disposal.

For the purposes of definition, "storage" implies retrievability, i.e., mistakes can be corrected in principle; "disposal" implies irretrievability. In passing we should mention that transmutation of *fission products,* as opposed to transuranic elements, to stable isotopes is entirely impractical.

Storage and disposal (in the earth) are two very different stratagems. Storage retains future options and provides safety against error, but requires full societal responsibility. Disposal guards against an irresponsible society but offers the possibility of environmental hazard at some future time. Decisions regarding storage and disposal are by no means entirely technological. They are to a large extent societal in nature and relate to very uncertain matters: the stability of societies over time; the extent of responsibility we have over future generations of man and even over the biosphere generally. In addition, there is a desirable economic goal that waste management in the power industry should cost only a small fraction of the cost of delivered electricity.

1. Short term storage for thermal decay:

The rate of heat production in high level wastes after 5 years of storage is about 0.6% of that encountered one day after the termination of fission in the reactor. ^{90}Sr and ^{137}Cs are the two principal abundant isotopes decaying at this point in time. Wastes during this early period of storage have been and continue to be kept as aqueous solutions/slurries in tanks, and this method appears to be generally satisfactory for short term storage. There are a few design features, however, which deserve considerably more attention:

a) The tanks should be so located and constructed that they will be secure from rupture by surface detonation of thermonuclear weapons;

b) They should be located in or on dry, highly impervious rock as remote as possible from active faults, mobile underground water, and aquiters;

c) The tanks should be designed for thorough decontamination in the case of damage or deterioration and should possess multiple containment barriers each one of which can be decontaminated and repaired; and

d) If left unattended, the tanks and secondary barriers should secure the contents for at least 500 years against the usual ravages of time.

It seems advisable in any case for the initial storage in water to be as short as possible. Water is a highly mobile fluid and requires a strong structure for containment; the chemical reactivity of aqueous solutions/slurries of intensely radioactive wastes is high. It should be possible to remove water after 1 to 3 years and reduce the waste to some suitable stable solid form. The form may have to be granular initially to permit better heat dissipation, but clearly it can be converted to a bulk glass or ceramic after 3 to 5 years. Studies by the AEC suggest that wastes may be solidified in granular form immediately after fuel reprocessing (i.e. after 0.3 years), thus obviating tank storage (1, 9). This research should be pursued vigorously.

2. *Disposal in Solar Orbit:*

By the year 2000 it is expected that the entire U.S. nuclear industry will be producing the order of several thousand metric tons of high level waste products per year. It is conceivable that this material could be placed in solar orbit by a group of some tens to 100 large boosters or by some alternate series of space station shuttles and interplanetary boosters (6). This plan is both expensive — costing perhaps $5-10 billion per year by 2000 — and currently unfeasible. The probability of failures which could lead to atmospheric reentry must be essentially zero and, in

addition, pay loads must themselves be designed to survive reentry and impact in an intact and recoverable state. The vaporization of even 10^6 Ci of long-lived high level waste products in the upper atmosphere would be a serious event leading probably to significant radiation doses to the lungs of man and animals. Our only experience with the reentry of radioactive material involved the disintegration in April 1964 of a SNAP thermoelectric satellite which contained 17,000 Ci of ^{238}Pu (about 900 g). It is estimated that this relatively small release of radioactivity will result in a cumulative 50 year dose to the lungs of adult humans of about 36 millirem (about ⅓ of one yearly dose from background radiation) (11).

The idea of disposal in solar orbit is satisfying in its simplicity and finality and should be reviewed periodically in light of developments in space technology.

3. *Transmutation and fission of transuranic actinides:*

Various proposals exist for storing wastes on or in the earth for whatever times are required for decay to nonhazardous levels. Inherent in these plans is the idea that man must bear responsibility for actions over times that are long compared with the lives of nations. The requisite social and legal institutions simply do not exist to assure responsibility over periods of 800 years (fission products) upward to millions of years (actinides). It seems prudent, therefore, to do everything possible to minimize the time required for the wastes to decay to safe levels. The one process which will decrease containment time by more than 3 orders of magnitude — from several million years down to 800 years — is nearly total removal of transuranic elements (4, 12).

At present the recovery of U and Pu from fuel reprocessing is 99.5% and most of the other actinides are not re-

covered. This compares with a technological limit for extraction of actinides from the waste stream of about 99.9999% (Ac through Pu) and 99% for Am through Es. As can be seen in Fig. 3, *such complete extraction would lower the long term relative toxicity by 3-4 orders of magnitude compared with current practice.* Extraction of 99.9%-99.95% U, Np, and Pu and of 99% Am and Cu (middle curve) can be accomplished realistically and would result in a long term actinide hazard about equal to that for fission products, which is considered to be small.

If the recovered actinides were burned up by recycling through a light water reactor, the additional costs for improved extraction plus burn up would be about 1.5 times that for current fuel reprocessing and result in an increase in delivered electricity of about 0.3 mills/kw hr. (e) on a base of 8-9 mills/kw hr (e) (4). It is believed that light water reactors would not have to be altered much, except to increase ^{235}U enrichment slightly, in order to burn up actinides by fission. A much better route would be to burn up actinides in fast neutron reactors where the fast neutron spectrum is much more efficient than thermal neutrons in transmuting actinides to fissionable isotopes. If fast neutron reactors were used, the cost increment on electricity is estimated to be only 1% or less for improved extraction and burn up. At steady state, about 1 part in 7-10 of the fuel in a Pu-fueled liquid metal fast breeder reactor would be actinides other than Pu.

Geological burial or other disposal schemes would still have to apply to the fission products. The increment of cost cited above, therefore, is in excess of the cost of disposal of fission wastes, the costs of which may be expected to lie in the range 0.005-0.008 mills/kw hr (e).

The alternative is the continued production of waste material so laden with Pu and other long-lived transuranic

elements that confinement periods of millions of years will be necessary. While secure storage or burial may well be possible for periods of 800 years for the decay of fission products, this is not necessarily the case for periods thousands of times this. Within one million years, another ice age could occur, continental erosion of hundreds of meters is likely, and even the species man could become extinct.

If the transuranic elements were removed almost completely, then *storage* in massive surface vaults for 800 years or any one of a number of deep burial schemes — e.g., in ancient bedded salt deposits — become feasible. If the problem is one of the *disposal* of transuranium elements, then surface vaults are excluded and some schemes for geological burial, including the now favored burial in salt mines, become of questionably security.

4. *Deposition in oceanic trenches:*

Oceanic trenches represent lines along which one oceanic plate is sinking beneath the adjoining plate into the mantle of the earth. Ocean sediments accumulate to great depth in trenches and subside, in part at least, with the sinking plate, which may descend at rates of the order of 1 cm/year. Thus, anything deposited in the sediments of the trench must become more deeply embedded by virtue of mechanical locking with the descending plate and the continuing deposition of sediments and must eventually be ingested into the mantle of the earth.

An objection to the disposal of wastes in oceanic trenches arises from the fact that the radioactive wastes might be exposed to an aqueous environment — seawater and/or wet sediments for long periods of time during which they will still generate significant amounts of heat. The possibility of radiolytic decomposition of containers and the possible loss of material by accidental sinking away from the trench

introduce considerable risk even for the disposal of fission products. The method is appealing in that confinement forever is guaranteed, providing only that the method of initial implantation totally and irreversibly separates the radioactive material from the oceanic environment. This method should be reviewed periodically.

5. Disposal in Antarctica:

Ice, like salt, exhibits plastic flow at modest pressures and is self-sealing. This property and the inaccessibility of the antarctic interior prompted Philbert (13) to propose disposing of high level wastes deep in the Antarctic ice cap, probably at the ice-rock interface. The wastes, in an encased vitreous form, with dimensions 0.3x3 meters, and heat output of about 5,400 watts, would be allowed to melt their way into the ice and slowly sink to the ice-rock interface (14). It would take an estimated 3-5 years to sink an expected 1.5 km to the interface assuming an ambient ice temperature of about −50°C. On the high central plateau around the Pole of Inaccessibility, the temperature at the ice-rock interface is estimated (but not as yet directly measured) to be −20 to −30°C. This region therefore probably has no free water at or near the interface. The absence of water is crucial to the plan since there must arise no possibility of channels of communication between the deep interior ice and the sea, some 600-1000 km away.

The ice of Antarctica appears to be very stable and ancient. Data on ice cores from "young" ice taken from an active ice stream near Byrd Station suggest an ice age of about 0.1 million years at depths of 2.2 km. Other studies show that the average temperatures in Antarctica have remained below freezing for more than 1 million years. On the other hand, some believe that very extensive lateral flows or "surges" of ice have occurred roughly every 10^5 years during the Pleistocene age. These would be expected

to thin the ice cap considerably and forcefully scour the continent. Material from the ice-rock interface of the interior might be transported to the sea rapidly in a "surge." Sites would be selected according to rock topography so that transport would be minimized in the event of a "surge." In any case, the enormous heat of fusion of the ice sheet alone implies a general stability for the future. Antarctic ice contains a heat of fusion equivalent to the entire solar input to earth over about 100 years.

The repository area could probably cover some 40,000 km², so the waste containers could be deposited sparsely to avoid a general heating of the ice. One 5400 watt container per km would contribute only 10% of the local geothermal gradient (~1.2×10^{-6} cal/cm²/sec.). It is probable that permafrost extends deeply into the rock in central Antarctica — perhaps to depths of 0.5-1 km — so that there is essentially no mobile ground water. Perhaps a safer alternate plan would be to emplace waste containers deep into the permafrost rock and effectively decouple them from all possible future motions of the ice.

The proposals regarding disposal in ice are attractive and ought to be pursued. Security for 800 years seems certain. Moreover, the present international character of Antarctica may permit it to serve as an international repository.

6. Deposition in underground caverns created by the detonation of nuclear devices:

This proposal (15) involves the introduction of fresh high level wastes as aqueous solution/slurry into a cavern formed 1000-2000 m underground by the explosion of a nuclear device. Rock is a poor conductor of heat and initially self-distillation, perhaps into surface heat exchanges, would serve to cool the wastes. Finally, after sufficient decay, the material would be allowed to dry and finally to

fuse with the rock to distribute the wastes within a natural silicate matrix. The hazards of this method lie first in the extensive and unpredictable fracturing of rock in the vicinity of an underground nuclear explosion — even to the surface. There seems to be no way to assure the absence of channels of communication between the cavern and the surface or underground aquifers. The explosion may serve also to release geological strain locally. Thus, minor faulting may occur out to a distance of from one to a few km from the site and offer additional channels. The advantage is that the method is quick, inexpensive (perhaps 0.01 mills/kw hr), and can accommodate fresh waste directly from the reprocessing plant. If each reprocessing plant could be supplied with such sites, the transportation of high level wastes could be obviated.

On balance, the plan seems very much more hazardous than others.

7. *Burial in ancient bedded salt formations or dry rock at intermediate depths:*

The method of disposal in bedded salt has been the subject of NAS studies (16) and the AEC has carried out extensive tests in the late 1960's at a salt mine at Lyons, Kansas (7, 17, 18). The 100 m thick formation is of Permian origin about 250 Million years old and lies at a depth of 300 m. The plan involves the deposition of radioactive waste in the form of metal encased ceramic cylinders about 25 cm in diameter and 3-5 m long into thick salt strata located at depths of the order of 300 m. The rooms would be back-filled with salt and sealed. Since water is the chief enemy, the salt deposits have to be ancient (have been secure from water for eons), currently dry, bedded under impermeable layers of clay or shale, and they must lie in geologically quiet regions essentially free of active faults.

In addition, the integrity of the deposits must not be violated or jeopardized by human activities, such as solution mining of salt and the deep bore holes left as the result of exploration for gas and oil. The Lyons site ultimately was abandoned in 1970 chiefly for these latter reasons (1, 19). Completely suitable sites may be difficult to find. A recent preliminary survey from the Kansas Geological Survey to the AEC (20) indicated that only one of several bedded salt regions in west and central Kansas seemed good enough to warrant further consideration. In fact, there may be very few suitable sites in the U.S. While bedded salt deposits are extensive, those that are at least 70 m thick and located within 700 m of the surface occur at only few locations: most extensively in Kansas, two smaller areas in Michigan, and one small area in New York south of Lake Ontario (1). To these should be added, however, salt-potash deposits in southern New Mexico. Recent AEC studies suggest, tentatively at least, that these deposits are also suitable. The salt domes of the Gulf area are considered unsuitable because of their geological history of migration.

Salt has desirable characteristics: It will undergo plastic deformation from modest overburden pressures and is thus self-sealing even at depths of 300 m; it is a better heat conductor than rock. Rather detailed calculations suggested that heat from radioactive decay would not have caused stresses sufficient to damage the overlying strata at the Lyons site. If valid, these calculations suggest that the entire output of high level waste in the U.S. through 2000 could be accommodated in about 1000 acres of bedded salt. The cost has been estimated to be about 0.05 mills/kw-hr for disposal of solidified waste 10 years old.

The method seems quite promising for fission products, but not for transuranic elements. The depths proposed —

of the order of 300 m — seem rather shallow to insure security for millions of years. Stability over millions of years past can provide little measure of future stability in the case of rather shallow salt beds.

Similar proposals have been made for storage and/or disposal in rock formations which are dry, impervious, show evidence of long geological stability, and are certain to have not future importance as mineral resources (1, 4, 7, 16). Ancient granites and metamorphic rock of the stable continental cores, some of which have radiological ages of 1 billion years or more, seem like possible candidates. Silicate rock has an advantage over salt in that it is essentially insoluble. On the other hand, rock does not undergo plastic deformation, at least at modest depth, and so is not self-sealing. The rigidity of rock, however permits mechanical excavations to depths of about 3000 m. Costs have been placed at about 0.07mills/kw-hr for hard rock options (4).

As mentioned above, proposals to deposit liquid and slurried wastes in underground caverns have been considered by the AEC for at least the Hanford and Savannah River facilities (9, 10). In the latter case, the plan has been under study for some 10 years. A report by the NAS recommended discontinuation in 1966, but a NAS review panel concluded the plan had sufficient merit to justify construction of a shaft and tunnels. More recently, further negative opinion has been received from NAS. A major objection concerns the mobility of the water initially associated with the wastes and the possible mobility of ground water in the vicinity of the caverns.

Care must be exercised in the matter of thermal stresses on rock as the result of radiogenic heat from the wastes. In the vicinity around a source of heat in rock there will be a

region of compressive stress merging into a region of relative tensile stress and these regions will migrate as the thermal pulse slowly moves outward. A familiar analogy in physics is the billiard ball with a heat source at its center. Rock is very strong in compression but weak in tension. It seems advisable therefore that the heat loading be adjusted so that relative tensional stresses never exceed the static compression of the overburden, i.e., that net tension is never developed. If thermal fracturing of overlying rock can be obviated, the proposal to place wastes in stable rock formations seems attractive. Depending on rock characteristics, it may be possible to permit peak temperatures high enough to eventually fuse the wastes into the rock.

8. Deep burial:

While rock at modest pressure and temperature does not deform plastically, it will do so at the more severe conditions encountered at great depth (6). The geothermal temperature gradient is about 30°C/km in the upper lithosphere. At 17 km, the temperature is of the order of 500°C at a pressure of about 5 k bar. Under these conditions, slow plastic deformation into a cavity can occur. If it were possible to drill very deep holes into the stable silicate core of the continent, then ceramic cylinders of waste could be emplaced in a verticle array into a region where self-sealing and permanent entrainment would occur. The axial geometry also would be a favorable one for the dissipation of radiogenic heat. The plan is not now feasible and, in any case, probably would be expensive. If electrically heated, rock melting drills were used, we estimate a cost of perhaps $20 million per hole. Assuming a 2 km depth of cylinders, each hole could accommodate perhaps 500 cylinders, each with diameter about 25 cm and length of 4 m. Each 1 G w(c) plant will produce waste equivalent to about 8 cylinders per year (~ 5 metric tons of waste products).

Thus, one hole should prove adequate on average for the operational lifetime of each reactor. By the year 2000, about 16 holes/year will be needed to hold the waste then produced. The cost of boring alone would be about 0.05 mills/kw-hr.

One advantage with the method is that such long retention is assured that transuranic elements may no longer represent a serious problem.

9. Injection of wastes in liquid form into wells:

It is a rather common industrial practice to dispose of various kinds of liquid wastes by pumping them via an encased well into porous rock formations such as sandstone or limestone. For example, U.S. Steel Corp. injects acid waste from steel-treating into a 1400 m well at Gary, Indiana, at a rate some 6.5 million gallons per month (5). In general, care is taken to select formations in which the porous rock stratum is layered between impermeable strata such as shale. The wastes can travel considerable distances laterally and examples are known in which apparently impermeable capping strata have either leaked or fractured as the result of hydrostatic effects.

In the case of limited resevoir capacity, low permeability, or viscous liquids, it is common practice to inject liquids under high pressure in order to fracture the rock, thereby increasing flow rate or capacity. This process is called "hydrofracturing." The behavior of such wells is often unpredictable, and surface contamination can occur, as was the case in a spectacular fashion in 1968 at the Hammerhill Paper Co. in Erie, Pa. There is also evidence, from the 4000 m well at the Army's Rocky Mountain Arsenal, Denver, that high pressure injections can trigger numerous minor earth tremors.

The experience with underground disposal of liquid wastes suggests that these methods would not represent an acceptable way to dispose of high level fission wastes.

10. Long term storage in surface structures:

Essentially two arguments exist for long term storage of solidified waste in surface vaults:

a) If only fission products are stored, then the periods involved (800 years) can be within the life expectance of man-made structures. Witness the pyramids of Eygpt;

b) Storage in surface vaults will buy time to develop satisfactory and totally safe methods of disposal. The latter argument, while reasonable, will impose an expensive step between liquid tank storage and final disposal. The first argument above is acceptable only if structures surely can be built to survive not only the ravages of time but also the impact of nuclear weapons and social change. The formidable design characteristics must be similar to those outlined above for liquid waste storages. Foremost, they must secure their contents from accidental release even in the absence of human attendance. It is also most desirable that they be impregnable to forcible entry. Even the pyramids have not fulfilled the latter criterion, and it is especially difficult to see how forcible entry could be prevented if the structures were, like the pyramids, left unattended.

If suitable structures can be built and if the transuranic elements can be eliminated from high level wastes, then long term storage in vaults offers the single advantage of retrievability. Surface vaults are clearly unsuitable in a world fraught with social and political instabilities over a scale of hundreds of years.

It is interesting that the AEC rejected years ago the idea of long term storage of solidified high level wastes in man-made vaults or mausolea. The focus has been on disposal in geological formations for 15-20 years. The idea has been resurrected recently since the salt mine at Lyons was abandoned around 1970 as a possible Federal waste depository. In May 1972 the AEC announced new plans for the interim management of solidified wastes (1). These plans call for the construction of "engineered surface facilities" (vaults) capable of storing the solidified wastes from commercial operations. These facilities are to be available for use in 1979-1980 when the first shipments of waste are ready for delivery from reprocessing plants. The facilities are to be designed to isolate the wastes safely for centuries with complete retrievability. The plan still stands at this writing, as far as we can determine. It strikes us as an expensive proposal born of desperation. It would appear that a permanent disposal plan cannot be assured by 1980.

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TABLE I

Typical yields of fission products with intermediate and long half-lives from processing one metric ton of light water reactor fuel irradiated to 33 x 10^3 watt-days (thermal) per metric ton fuel.*

Element	Half-life	Curies remaining after decay of:			
		10 years	100 years	500 years	1000 years
Ce-144/Pr-144	285 day	300	—	—	—
Ru-106/Rh-106	367 day	1100	—	—	—
Eu-155	1.8 yr.	160	—	—	—
Cs-134	2.1 yr.	8300	—	—	—
Sb-125/Te-125m	2.7 yr.	980	—	—	—
Sr-90/Y-90	28.1 yr.	1.2×10^5	1.32×10^4	0.6	—
Cs-136/Ba-137a	30 yr.	1.6×10^5	2.1×10^4	2	—
Sm-151	90 yr.	1100	520	30	0.4
Tc-99	2.1×10^5 yr.	15	15	15	15
Zr-93	9×10^5 yr.	3.7	3.7	3.7	3.7
Cs-135	2×10^6 yr.	1.7	1.7	1.7	1.7
Pd-107	7×10^6 yr.	0.013	0.013	0.013	0.013
I-129	17×10^6 yr.	0.025	0.025	0.025	0.025
Total Curies (approx)		300,000	35,000	53	22

*Calculated from data in refs. 1, 7, and 22. A 1000 Gw(e) plant will yield about 30 tons of fuel for reprocessing per year.

TABLE II

Typical yields of actinides with intermediate and long half-lives in the waste stream from processing one metric ton of light water reactor fuel irradiated to 33×10^9 watt-days (thermal) per metric ton fuel.*

Element	Half-life	Reprocessing 0.3 yrs.		Amount Present After Decay of: 10 yrs.		500 yrs.		10,000 yrs.		100,000 yrs.	
		g	Curie	g	Curie	g	Curie	g	Curie	g	Curie
Np-237	2.1×10^6 yr.	760	0.59	760	0.59	786	0.61	810	0.63	790	0.61
Pu-238	86 yr.	5.8	105	5.5	100	0.1	1.8	—	—	—	—
Pu-239	24,400 yr.	27.5	1.7	27.5	1.7	32	2.0	59	3.6	4.5	0.3
Pu-240	6,580 yr.	8.5	2.0	19.2	4.5	38.4	8.8	13.9	3.2	—	—
Pu-241	13.2 yr.	4	464	2.4	273	—	—	—	—	—	—
Pu-242	379,000 yr.	2	0.009	2	0.009	2	0.009	2	0.009	1.7	0.007
Am-241	462 yr.	54	189	55.6	198	29.5	103	—	—	—	—
Am-243	7,370 yr.	82	17.0	82	17.0	77	16.0	31	6.5	—	~0.001
Cm-244	17.6 yr.	30	2570	19.7	1700	—	—	—	—	—	—
Total g/metric ton feul		974		974		965		916		796	
Activities, including daughter products (approx)			200,000		10,000		900		100		50

*Calculated from data in refs. 1, 7, and 22. A 1000 Gw(e) plant will yield about 30 tons of fuel for reprocessing per year.

TABLE III

Projected waste inventories at the permanent repository from nuclear power generation.*

	By the Calendar Year		
	1980	1990	2000
Installed nuclear capacity (Gw(e))	100	420	734
Accumulated high-level waste			
Vol of waste (10^3 ft^3)	3.2	74.2	319
Thermal output (10^6 w)	1.2	24.4	94.9
Total radioactivity (10^6 curies)	329	7020	27700
Sr.90 (10^6 curies)	59.0	1310	5290
Cs-137 "	83.1	1850	7500
Pu-238 "	0.102	2.34	9.88
Pu-239 "	0.002	0.04	0.16
Pu-240 "	0.004	0.10	0.47
Am-243 "	0.15	3.54	15.3
Cm-244 "	1.58	34.1	133.3
Accumulated alpha waste			
Thermal output (10^6 w)	0.014	0.17	0.48
Total radioactivity (10^6 curies)	14.2	151	300
Total mass actinides (10^6g)	1.4	15.8	38.3
Pu-238 (10^6 curies)	0.23	2.57	6.02
Pu-239 "	0.05	0.58	1.41
Pu-240 "	0.07	0.83	2.02
Pu-241 "	13.8	146	286
Am-243 "	0.06	1.03	4.74

*From refs. 6, 7, and 8. Half the waste is assumed to have aged 5 years and half 10 years.

LEGEND TO FIGURES

Fig. 1 Thermal power from light water reactor wastes. Fuel utilization is taken to be 33×10^9 watt-days (thermal) per metric ton with recovery of U and Pu only with 99.5% efficience. Adapted from ref. 4.

Fig. 2 Relative toxicity of wastes from light water reactors. Burn up and recoveries are in Fig. 1. The relative toxicity is defined in the text and is relative to uranium ore. Adapted from ref. 4.

Fig. 3 Relative toxicity of waste actinides and their decay products for different degrees of actinide extraction. Burn up of fuel is as in Fig. 1. Top curve represents current practice (99.5% U and Pu); middle curve represents practical recoveries; lower curve represents likely limits. Adapted from ref. 4.

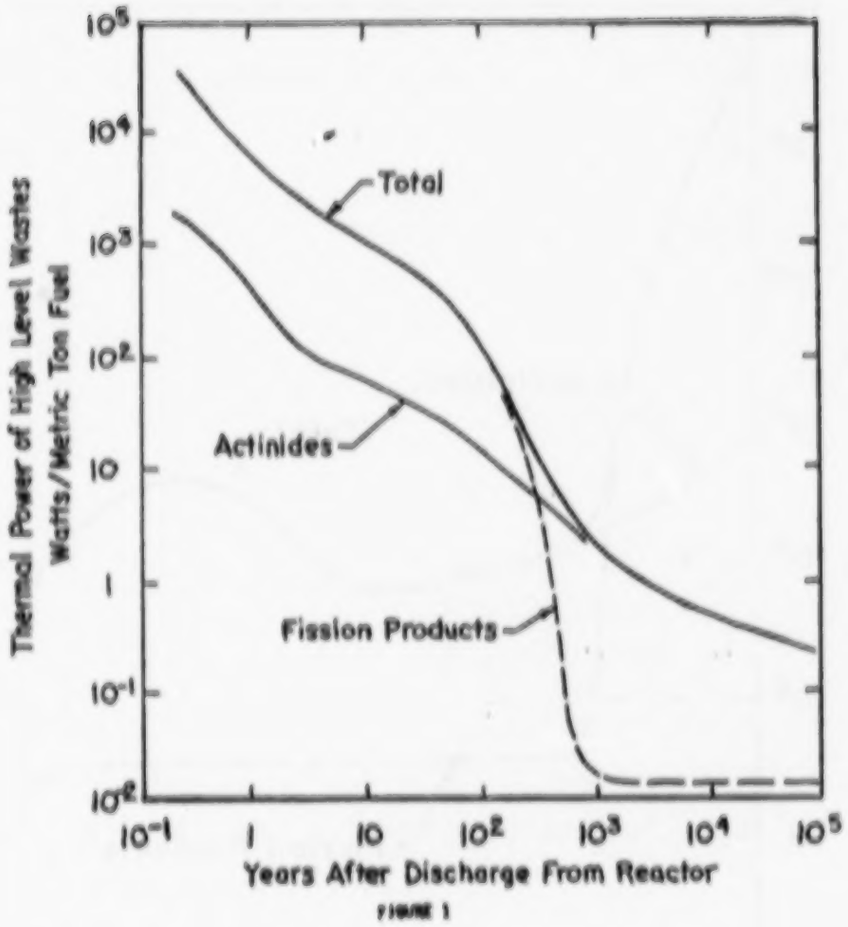

FIGURE 1

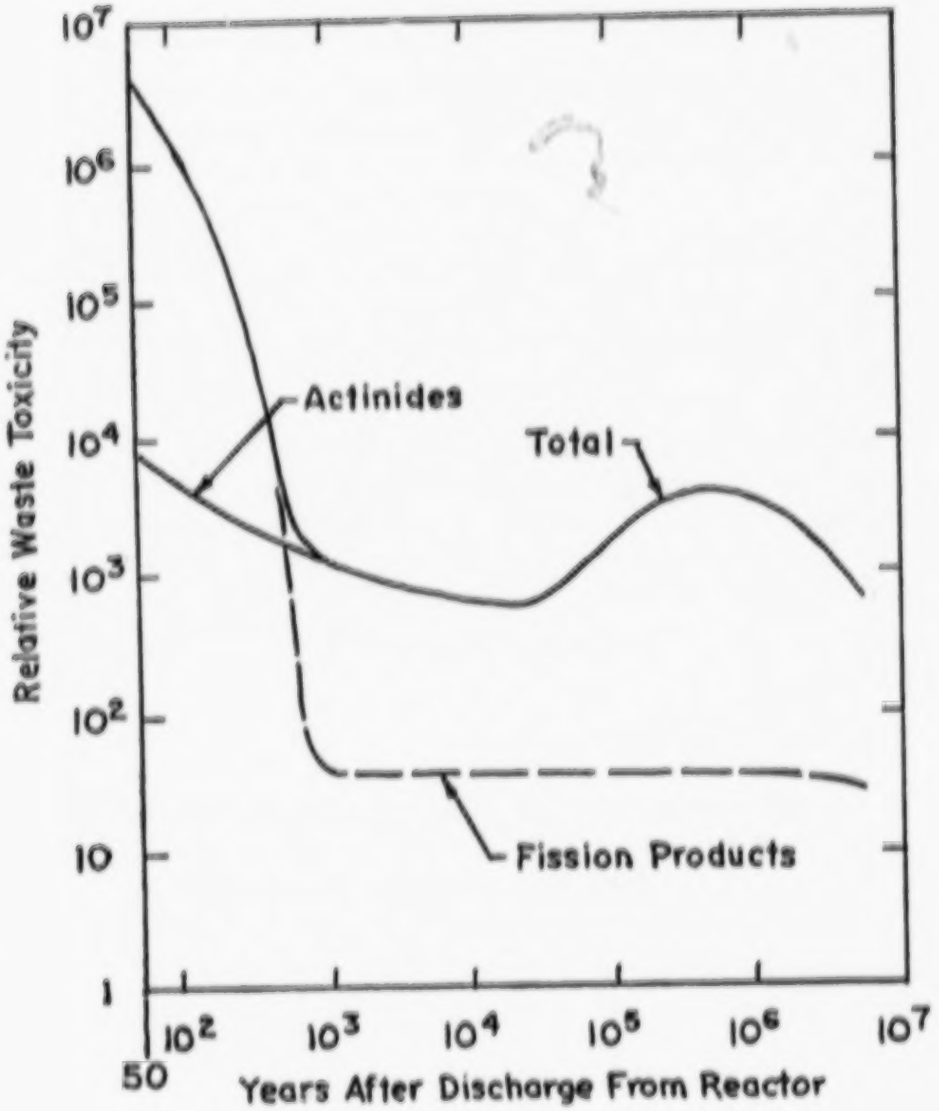

FIGURE 2.

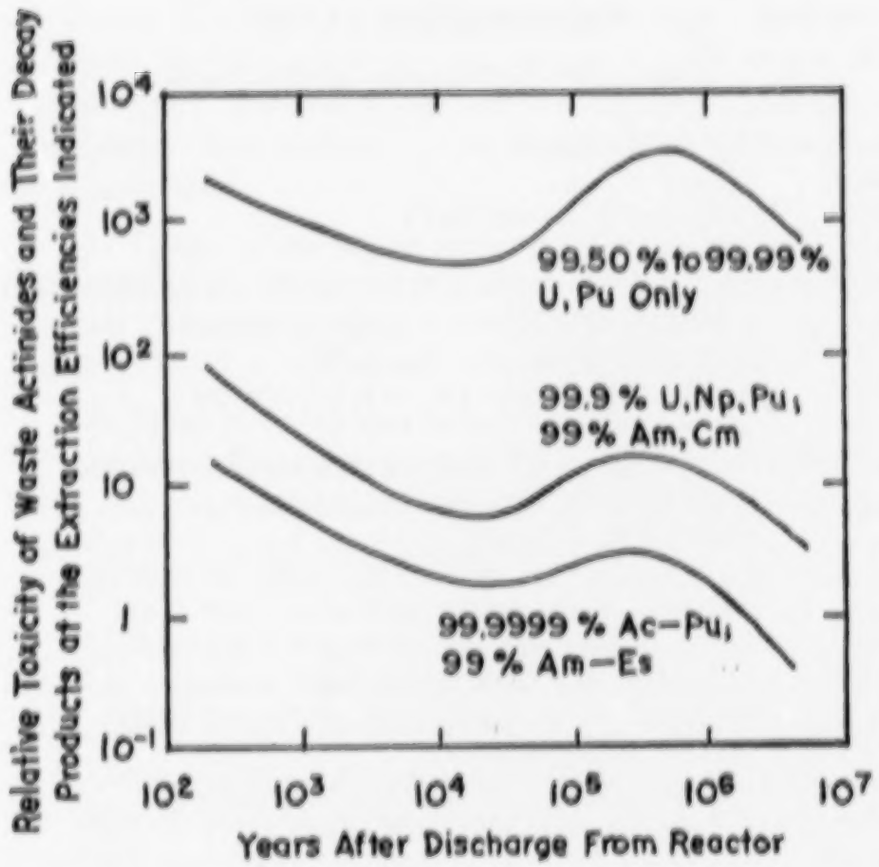

FIGURE 3

RADIOLOGICAL IMPACT OF WEST VALLEY REPROCESSING PLANT

SUMMARY AND RECOMMENDATIONS

I. INTRODUCTION
II. SITE
III. POPULATION DENSITY
IV. URANIUM AND PLUTONIUM RECOVERY
V. RADIOACTIVE WASTE CONTENT OF SPENT FUEL
VI. INTERCEPTOR TANKS AND LAGOONS
VII. LIQUID WASTE DISCHARGES
VIII. SEDIMENTATION IN THE LAGOONS AND CREEKS
IX. MONITORING BY THE STATE OF NEW YORK
X. MAXIMUM PERMISSIBLE WATER CONCENTRATIONS
XI. RADIOACTIVE CONTAMINATION OF CREEKS
XII. RADIOACTIVE CONTAMINATION OF FISH
XIII. NEED FOR MORE RIGOROUS STANDARDS
VIV. LEAKAGE FROM BURIAL GROUNDS
XV. RADIOACTIVE CONTAMINATION OF DEER
XVI. I-129 CONTAMINATION
XVII. ATMOSPHERIC Kr-85 CONTAMINATION
XVIII. ATMOSPHERIC TRITIUM CONTAMINATION
XIX. ATMOSPHERIC PLUTONIUM CONTAMINATION
XX. PLUTONIUM CONTAMINATION OF CREEKS
XXI. COMPOSITE MAXIMUM HUMAN RADIATION EXPOSURE
XXII. COMPOSITE MAXIMUM DEER RADIATION EXPOSURE

SUMMARY AND RECOMMENDATIONS

The reassurances from the management of Nuclear Fuels Services, Inc., that irradiation of the population around the reprocessing plant has not been excessive is a myth, when applied to wildlife. The exposure to humans, while somewhat less, is greater than necessary. In order that these exposures be reduced to more reasonable levels, it is recommended that:

(1) The more rigorous standards suggested by the National Academy of Sciences — National Research Council be implemented. Specifically, NFS should be permitted a fraction of the total permissible population exposure. Ten percent of the current limit would not be unreasonable.

(2) Rather than applying maximum permissible concentrations at the point of discharge into Cattaraugus Creek, the more stringent standards should be applied to Buttermilk Creek, as well as the lagoons.

(3) More rigorous and detailed monitoring of the wildlife within the property boundaries must be accomplished, and the more stringent standards applied to humans should be applied to all species found within these confines.

(4) The emission of I-129 from the plant must be reduced, or better, eliminated entirely. At the very least, the idoine scrubbing system must be operative during all dissolutions. Extensive study of the biological dispersion of I-129 at all trophic levels, both aquatic and terrestrial, is imperative.

(5) A krypton recovery system must be added. False economies which maintain low fuel costs at the expense of irretrievable local and worldwide radiation exposure must no longer be tolerated. As a first step in redressing this imbalance, the emission of long lived emitters such as Kr-85, in large quantities, must cease. The cost, relative to the biologic impact, would be negligible. It is a cost which should rightly be shared by all who benefit from electrical power through increased electricity rates and fuel processing tolls.

(6) Extensive human monitoring must be accomplished to determine the extent of contamination already present,

and to detect future increases before irretrievable damage occurs. The work and vocational habits of the local population and their dietary excursions must be accurately and systematically determined. A thorough accounting of the I-131, I-129, Pu-238, Pu-239, Sr-90, Cs-137, and -134, etc. content of the tissues of neighboring human populations should be accomplished through post-mortem examination, and correlated with place of residence, work, diet, etc. A program of whole-body counting of selected individuals whose exposure is likely to be excessive should be instituted. Bioassay programs to estimate tritium, Sr-90, and plutonium contamination of local populations would also be of value.

(7) The extent of local groundwater contamination by the lagoons and burial grounds should be determined and monitored.

(8) More effective burial procedures are necessary to reduce the amount of seepage from these pits.

(9) Factors promoting resolubilization and dispersion of radioactive bottom sediments should be assessed, and avoided. The cause for the amount of uranium leaving the lagoons to exceed the amount entering should be investigated and controlled.

In summary, the true cost of a nuclear-fueled electrical industry greatly exceeds the current average out-of-pocket cost of 2 mills per kwh. The true cost, in biologic terms, has yet to be determined. It will not be measured in dollars and cents.

I. INTRODUCTION

Until 1966 all nuclear fuel reprocessing was accomplished at government-owned installations such as the Hanford Works at Richland, Washington, the National Reactor

Testing Station in Idaho, and the Savannah River Georgia plant. As early as 1960, one private firm — Nuclear Fuels Services, Inc. (NFS) — concluded that recovery and reuse of plutonium and uranium from spent nuclear fuel would be a profitable endeavor. According to NFS estimates, plutonium recycle permits a 10% reduction in fuel costs. If nuclear fuel costs 2 mills per kilowat (KW) hour, then plutonium recovery and reutilization permits a credit of approximately 0.2 mills per KW hour.

Based on projected requirements for plutonium in breeder reactors, as well as plutonium recycle in current uranium based light water reactors, the decision to proceed with the first private reprocessing plant in the world was made in the early sixties. A permit was issued to NFS by the Atomic Energy Commission (AEC) for construction of the West Valley, New York plant in April, 1963, and a provional operating permit on April 19, 1966. Capital expenditure for this construction was approximately 32 million dollars.

II. SITE

NFS is located on a 3300 acre site owned by and leased from the New York State Atomic and Space Development Authority near the towns of Ashford and West Valley in Cattaraugus County, New York, 30 miles southeast of Buffalo. Both the property and the reprocessing plant, which lies 4000 feet from the nearest boundary, are isolated from the environs by exclusion fences. The installation sits amidst rolling hills reaching 500′ above sea level which are cut by two deep ravines to the north of the complex. Erdman Brook flows by the solid waste burial grounds southeast of the plant (Fig. 1) and by the reprocessing plant before emptying into Franks Creek. The latter drains into Buttermilk Creek which flows through a 100′ deep ravine north of

the plant. Buttermilk Creek, in turn, flows into Cattaraugus Creek which traverses a 300′ deep ravine approximately 3 miles north of the plant. The confluence of Buttermilk and Cattaraugus Creeks is just beyond the limit of the NFS property, while Cattaraugus Creek is entirely within the public domain.

III. POPULATION DENSITY

Population density in these environs is relatively low, despite the proximity to Buffalo. Based on 1960 census estimates, there are approximately 6000 people within a 5-mile radius of the plant, 16000 within 10 miles, and 170,000 within a 25-mile radius. Local wildlife consists of typical upstate New York lowland small game, fowl, and deer. Density of these species is not known. Aquatic biota in the discharge streams consists of an algal based food chain supporting a variety of species of fish such as shiner, horned dace, chub, white suckers, stoneroller minnows, smallmouth bass, pike, trout, etc. Maximum fishing pressure on the discharge streams occurs at Springville Dam, which lies approximately 6 miles downstream (4 miles as the crow flies) and at the mouth of Cattaraugus Creek on the shores of Lake Erie, approximately 39 miles downstream.

IV. URANIUM AND PLUTONIUM RECOVERY

NFS employs a chop, leach, Purex-solvent extraction process in recovering usable uranium and plutonium from burnt-up reactor fuel. A 1000-megawatt electric (MWe) reactor contains approximately 100 tons of uranium as fuel, one-third of which, or about 30 tons, is replaced annually. Through 1970, NFS employed 190 people who processed over 530 tons of fuel with recovery of 1300 kg of plutonium

at a cost to the utilities, in 1969, of $33,380 per metric ton of uranium (MTU). The plant ceased dissolving fuel in November, 1971, so that major renovations and expansion could be effected. An average of 100 tons were processed during each of the first 5 years of operation. NFS anticipates an annual load of 125 tons per year by 1975, and 2950 tons by 1980. Current expansion will facilitate a 3 ton per day capacity.

Spent fuel assemblies are unloaded from their shipping casks underwater, and are placed in a storage pool for further cooling. In the initial processing step, the fuel is transferred to hot cells where the end pieces are removed, and the rods mechanically chopped into small pieces and placed in baskets. In the subsequent leaching step, the fuel sections are dissolved in a vat of boiling nitric acid which leaves the undissolved fuel containers (cladding hulls) behind. The dissolved fuel is then run through several extraction cycles to separate uranium and plutonium from waste fission products, while the undissolved cladding hulls and other solid wastes are buried in the burial ground. In the final purification cycle, uranium and plutonium are further refined by additional solvent extraction and ion exchange.

The processing of a single load of fuel from a given reactor is known as a "fuel campaign". In a typical campaign in 1960, 20 tons of fuel from the Yankee plant at Rowe, Massachusetts were divided into 23 batches for dissolution between the 24th of May and the 9th of July. A given batch is processed, on the average, by 6 hours of dissolution on two consecutive days. The average campaign has required 4-6 weeks to complete. Of the 109 tons known to have been processed in 1969, 28 tons derived from the New Production Reactor at Hanford and were dissolved between February 17 and April 1, 21 tons from the same

source between April 1 and May 10, 20 tons from Rowe Yankee between May 24 and July 9, and an additional 30 tons from Hanford between August 18 and September 21. Relatively low burn-up fuel (on the order of 22,000 megawatt days per metric ton of uranium, or MWD/MTU) was processed from 1966-1968. Starting in June of 1969 higher burn-up fuels (30,000-40,000 MWD/MTU) were processed resulting in the discharge of greater amounts of radioactive waste products.

V. RADIOACTIVE WASTE CONTENT OF SPENT FUEL

Typical nuclear fuels, after 30,000 MWD/MTU burn-up and 150 day cooling contain 5 million Curies (Ci) of total beta-gamma activity per ton, including 98,000 Ci of strontium-90 (SR-90), 8400 Ci of krypton-85 (Kr-85), 375 Ci of tritium (H-3), 2.2 Ci of iodine-131 (I-131), and 30 millicuries (.03 Ci or 30 mCi) of iodine-129 (I-129). Table 1 summarizes the total waste inventory of higher burn-up fuel per ton. Fission inventory of spent fuel increases proportionally with fuel burn-up as do the waste discharges. Kr-85 yields, for example, range from 6000 Ci per ton at 20,000 MWD/MTU burn-up, and 8,000 Ci per ton at 35,000 MWD/MTU, to 9,100 Ci per ton for 40,000 MWD/MTU. I-129 content increases from 30 mCi per ton for 30,000 MWD/MTU to 40 mCi for 40,000 MWD/MTU. There are concomitant increases for tritium and other fission products. It is expected that with the increased plant capacity and processing of higher burn-up fuels that the tritium released in the NFS liquid discharges will increase from the present high of 1,200 Ci per month to as much as 20,000 Ci per month. Uranium content of spent fuel decreases from the original enriched levels of up to 3% to 0.65-0.85% at the time of reprocessing.

Almost all of the waste Kr-85 is released to the atmosphere during processing along with approximately 25% of the available tritium. Smaller amounts of xenon-133 (Xe-133) and Xe-131m and 90% of the I-129 content of the fuel are also discharged through the 60m stack. Most of the waste fission and activation products remain in liquid form at the end of reprocessing.

Higher level liquid wastes are reconcentrated and stored in multiple walled underground storage tanks set within steel saucers and supplemented by emergency stand-by tanks. About 600,000 gallons of high level wastes have been accumulated to date. NFS estimates that off-site shipment of these 600,000 gallons, for permanent storage, would cost a prohibitive $17,000,000. Consequently a high level liquid waste solidification capacity is included among the current expansion plans. Permanent long-term storage of the solidified high level wastes will be at a Federal repository, whenever one is established. In the meantime, these wastes will remain at NFS in either a liquid or solid form. Section 3 of this report deals further with the waste disposal problem.

VI. INTERCEPTOR TANKS AND LAGOONS

The low level liquid wastes from evaporator condensates, plant floor drains, and laundry and decontamination operations are discharged into two 22,000 gallon interceptor tanks. The plant license specifies (spec. 4.2.1 of license CSF-1) that in any calendar quarter no more than 48 Ci of unidentified alpha and beta activity (including tritium and I-131) shall be released from the interceptor tanks, and that the concentration of these wastes shall not exceed 5,000,000 pico-curies/liter. If the waste concentration in the interceptors exceeds these limits, the wastes are either diluted further or reprocessed prior to discharge to a series

of three unlined lagoons excavated from the ground near the interceptor tanks. These lagoons provide a reservoir of approximately 5 million gallons, enough for 100 days operation. It is estimated that a plant utilizing the Purex process produces between 10,000-100,000 gallons per ton of fuel. Lagoon-1 (300,000 gallon capacity) overflows to lagoon-2 (2,300,000 gallons), which in turn is discharged to lagoon-3 (2,500,000 gallons). The three lagoons, on the average, provide a one-month hold-up for the low level liquid wastes during which varying amounts of radioactivity settle to the lagoon bottoms. Finally, lagoon-3 is discharged to Erdman's Brook through a monitored valve system at a rate dependent upon the flow in Cattaraugus Creek. Typical discharge rates during the 1969 campaigns were 11.5-75 gallons per minute (up to 108,000 gallons per 24 hours at continuous sustained discharge).

The NFS license stipulates (spec. 4.2.2) that "activity released to Cattaraugus Creek from all sources on the site shall not at any time result in a concentration, as measured in the monitoring station in Cattaraugus Creek, which exceeds twice the concentrations specified in Title 10, CFR part 20; provided, however, that in any 365 consecutive days, the average concentration of radioactivity in Cattaraugus Creek shall not exceed that specified in Title 10, CFR part 20". Since both Erdman's Brook and Buttermilk Creek remain within the confines of the NFS restricted area, the AEC sets no limits on the amount of radioactivity in these waters. Concentration limits apply after dilution in Cattaraugus Creek.

VII. LIQUID WASTE DISCHARGES

Table II summarizes the total tritium, gross alpha, gross beta (less tritium), Sr-90, and I-129 discharged to Cattaraugus Creek in the first 4 years of NFS's operations. The

increased quantities in each category are a reflection not so much of increased volumes of fuel processed as of the processing of higher burn-up fuels. Assuming that 100 tons of fuel contain 37,500 Ci of tritium, and that 65% or approximately 25,000 Ci should be available for discharge to surface waters during reprocessing, the discrepancy between the maximum 5,980 Ci discharged to Cattaraugus Creek in 1969 is attributed to tritium leakage during reactor operations and discharge at the reactor site, before the fuel reaches NFS.

During the February-September campaigns in 1969, a total of 109 tons of fuel were processed, with tritium accounting for 13 times more activity in the lagoons and 33 times more in the Creek than any other single nuclide. The relatively greater tritium concentration in the Creek as compared to the lagoons is accomplished by sedimentation of nuclides such as Sr-90, Cs, Co-60, and Ru-106 in the lagoons.

VIII. SEDIMENTATION IN THE LAGOONS AND CREEKS

Approximately one-half of the gross beta (excluding tritium) and two-thirds of the alpha activity is retained in the lagoons. Greater than 90% of the Ce-144, Pm-147, and Zr-95 is deposited in the lagoons while 70-75% of the cesium isotopes, 59% of the Co-60, 39% of the Ru-106, and 7% of the Sr-90 are retained. Among the alpha emitters, sedimentation removes more than 90% of the plutonium (Pu) discharged from the interceptors. However, U-232, -234, and -238, which account for only 2½% of the activity in the interceptors, are present in 8.5 times greater concentration at the point of discharge from lagoon-3 indicating that uranium previously deposited in the lagoons is redissolved and discharged to Cattaraugus Creek. Most of the Ru-106, Sr-90, Co-60, and U are present in a soluble form in the

lagoons accounting for their relatively greater concentration at the point of discharge into Erdman's Brook. Those nuclides which are deposited in the lagoons are largely in an insoluble form, excepting the cesium isotopes which may be either soluble or insoluble.

Tritium, Ru-106, and Sr-90 constituted the principal nuclides in both Buttermilk and Cattaraugus Creeks during these campaigns. Lesser amounts of Cs-134, Co-60, U-232, -234, and -238 are also found in the Creeks. During these 7 months of 1969 a total of 1700 Ci of tritium, 15 Ci of Ru-106, 8.3 Ci of Sr-90, 8 Ci of Cs-137, 2 Ci of Cs-134, 0.16 Ci of Ce-134, 0.2 Ci of Co-60, 0.59 Ci of Sb-125, etc. were discharged from lagoon-3 to Erdman's Brook. Among the alpha emitters, a total of 1.8 mCi of Pu and 32 mCi of U were released.

Greater than 90% of the Cs-137 activity was removed from the water by deposition in passage from lagoon-3 to Cattaraugus Creek. Erdman's Brook and Franks Creek also retained 66% of the Co-60, 72% of the Sr-90, 31% of the Sb-125, and 26% of the Ru-106. Deposition within the property boundaries, of the Sr-90 at least, was quite variable and pH dependent. In November, when the streams were neutral, 10% of the Sr-90 was removed, whereas in June 75% of the Sr-90 was deposited at a Ph of 11. Other parameters affecting deposition were not investigated, nor is much known about what factors promote dissolution of previously deposited activity.

IX. MONITORING BY THE STATE OF NEW YORK

The New York State Department of Environmental Conservation instituted a radiation surveillance program around NFS soon after startup. Its data are usually expressed as average, minimum and maximum concentrations

measured at several points along Buttermilk and Cattaraugus Creeks. Table III summarizes the maximum values observed in Buttermilk Creek at Thomas Corner Road and in Cattaraugus Creek at Springville Dam (6 miles from lagoon-3 and 2 miles from the confluence of Buttermilk and Cattaraugus Creeks) from 1966-1972. Maximum values are recorded in Table III since radiation protection standards are designed to provide a health margin of safety above and beyond the highest observed levels. The 1966 Cs-137 level represents a pre-operational value.

X. MAXIMUM PERMISSIBLE WATER CONCENTRATIONS

The maximum permissible concentrations allowed in water by the State of New York are indicated on the following page (and in parentheses in Table III) in picocuries per liter (pCi/l). One piocurie equals .000000000001 Ci, or one-trillionth of a Ci.

Isotope	MPCw (pCi/1)
TRITIUM	3,000,000
Sr-90	300
Cs-137	20,000
Cs-134	9,000
Co-60	50,000
Ru-106	10,000
I-129	60
Pu-238	5,000
Pu-239	5,000
U-234	30,000
U-235	30,000

These concentrations correspond to maximum permissible levels established by the Federal Government in 10 CFR part 20. Ingestion of a given amount of water or food per

year, containing these maximum concentrations of each isotope, if it alone is present, would result in the maximum permissible radiation doses of 500 millirems per year to the whole body (by tritium and cesium), 500 millirems per year to bone (by Sr-90, Pu-238, and Pu-239), and 500 millirems per year to the stomach and intestines by Co-60 and Ru-106. The maximum permissible thyroid dose of 1500 millirems per year would be achieved by drinking average amounts of water containing 60 pCi of I-129 per liter every day of the year. It should be noted that all such limits are based on standard adult parameters, and assume that only a single isotope is present. If, for example, the Cs-137 level in water results in a whole body exposure of 125 millirems per year, and the Cs-134 another 125 millirems, then the maximum permissible level of tritium would have to be reduced by one-half. Children tend to accumulate some of the isotopes more avidly than adults. The whole body dose to an infant ingesting Cs-137 is almost twice that to an adult consuming the same amount of cesium. Not all of the currently accepted standards fully account for such variations.

XI. RADIOACTIVE CONTAMINATION OF CREEKS

It is clear that from start-up in 1966 through 1970 there was an increase in the levels of all the isotopes in both Buttermilk and Cattaraugus Creeks. It should be emphasized that although the maximum levels of Sr-90 have often exceeded the maximum permissible concentration (300 pCi/l) in Buttermilk Creek, in the view of the AEC the limits were not exceeded since Buttermilk Creek is within the NFS restricted area which is exempted from the 10 CFR part 20 regulations. The standards are not applied until Buttermilk Creek empties into Cattaraugus Creek beyond the NFS boundary. Unfortunately, the wildlife in the area are unaware of this regulation.

It has often been said by those responsible for the plant that the levels in Cattaraugus Creek "have not exceeded 20% of the maximum allowable concentrations" (see p. 1217 of the 1971 Joint Committee on Atomic Energy Hearings, Part III). What is not said is that the statement is only true when the average annual values for single nuclides are applied to their average annual limits. As a matter of fact, the maximum Sr-90 values in Buttermilk Creek would have consistently exceeded the average annual limits from 1968 until 1971 had the limits been applied. What is also apparent, from the maximum concentrations in Cattaraugus Creek (Table III) is that on one occasion in 1970 the Sr-90 level reached as high as 97% of the average limit. I-129 and Pu are also present, and increased markedly from 1969 to 1970. The State of New York noted a significant rise in Sr-90 concentrations in both creeks in the last 3 months of 1969. As stated in the 1970 annual report from the Department of Environmental Conservation, "the amounts of radioactivity detected in water and fish remained at levels which confirmed the need to install liquid waste treatment facilities to hold discharges as low as practicable." This comment followed an admonition, in the 1969 report, that the "concentration of radioactivity . . . particularly Sr-90, from the Creek systems below the discharge at the fuels reprocessing plant, remain at levels that indicate that corrective action should be taken in order to hold liquid waste discharges to as low levels as practicable." Corrective action was finally initiated by the AEC at the request of the State of New York. A new low level waste treatment plant became operative on May 23, 1971. Additional filtration, sedimentation, and ion exchange processes, with burial of the contaminated waste sludge and spent resins in the on-site burial ground, resulted in the lower levels of Sr-90 and cesium relative to earlier years. The increase in tritium, which is not removed by any existing

waste treatment process, indicates that without the new facilities, the levels of Sr-90 and Cs would also have increased in 1971. Ru-106 levels were not particularly reduced. Consistently low levels were observed in 1972 since almost no fuel was processed during the year.

Prior to 1952, the deposition of naturally occurring tritium in the atmosphere produced by cosmic ray interactions produced a natural tritium concentration of 6-35 pCi/l in surface waters. Atmospheric, and consequentially, surface water concentrations increased markedly during the period of active nuclear weapons testing. In order to monitor these levels, the Bureau of Radiologic Health has maintained 10 stations around the U.S. which have routinely analyzed tritium contamination for many years. From 1964-1966 these levels ranged from 2000-20,000 pCi/l. The maximum level of 1,480,630 in Buttermilk Creek in 1969 is far higher than values observed elsewhere in the U.S., including rivers downstream from nuclear installations. The high "normal" value of 20,000 pCi/l in the surface waters of the U.S. corresponds to a whole body dose of 1.14 millirems per year assuming ingestion of 440 liters of water per year. Although humans are not known to use Cattaraugus Creek for drinking water, an animal drinking Cattaraugus Creek water at the maximum observed tritium level (184,510 pCi/l at Springville Dam) would receive 10 millirems whole body irradiation per year. The average tritium content of Cattaraugus Creek at Springville Dam increased from 19,328 pCi/l in 1970 to 30,994 in 1971 and may be anticipated to increase steadily in the future. While the tritium contamination of drinking water is not routinely monitored throughout the State of New York, several community water supplies around NFS have been analyzed in recent years. There has been no detectable tritium in this water to date (minimal detectable concentration is 5000

pCi/l). No monitoring wells exist around the plant to determine the extent of contamination of groundwater, if any. A surface monitoring site, upstream from NFS, has revealed seepage from the burial grounds, however. Tritium concentrations here reached a maximum level of 426,400 pCi/l in 1971.

Considering the large quantities of tritium released, it is only a matter of time until detectable contamination of groundwater occurs. It is imperative that the likelihood and extent of such contamination be determined. Such information could modify current tritium release procedures if unsuspected hazards are found. NFS is quite aware of these problems. However, at the present time, it is not technically possible to reduce the tritium output. A team from Oak Ridge National Laboratories conducted studies in May and July of 1971 to evaluate the feasibility of tritium disposal into a 7000′ deep well on the NFS site. While there were no releases to the atmosphere from test injections into this well, the results of the underground portion of the tests have not been published. It is unknown whether the underlying strata are suitable for such disposal. Since the amounts of tritium to be released in the future will increase markedly, it is imperative that alternative methods be developed.

Maximum plutonium contamination in the Creeks in 1971 is indicated below:

	Pu-238 (pCi/1)	Pu-238 (pCi/1)
Buttermilk Creek	1.80	0.78
Cattaraugus Creek	0.016	0.014

XII. RADIOACTIVE CONTAMINATION OF FISH

Table IV summarizes the maximum levels of Sr-90, Cs-137, Cs-134, Co-60, and Ru-106 in fish taken from Buttermilk and Cattaraugus Creeks between 1964 and 1971. Prior

to operation of NFS, the majority of nuclides were undetectable. Prior to 1970, whole fish were analyzed (i.e. fish bone and flesh were not separated). Most of the Sr-90 concentrates in bone so that the pre-1970 values are not an accurate estimate of the Sr-90 concentrations in the eatable portions of the fish. The maximum Sr-90 level of 1400 pCi/kg in 1969 compared with the 1970 maximum of 1679 pCi/kg represents a much greater increase than is apparent from the numbers alone. The bone level of Sr-90 in the maximum 1970 sample was 10,491 pCi/kg, which, compared to the 1969 level of 1400 pCi/kg, indicates a marked increase.

In general, increases in all the nuclides in fish occurred between 1966 and 1970. Bottom feeders such as shiner, dart, dace, and sucker generally mannifest higher levels than do game fish such as trout, bass, and pike which feed nearer the surface. Unlike Sr-90, cesium, cobalt, and ruthenium concentrate largely in the fleshy parts so that whole fish levels are not likely to differ significantly from the 1970 and 1971 values. It is unclear why Ru-106 levels in fish declined so precipitiously in 1971 while the maximum Creek concentrations remained relatively constant.

Unlike the regulatory authorities of some countries, the U.S. government has not seen fit to apply radioactivity standards to fish and other comestible wildlife. However, it is not difficult to estimate the amount of radiation one would receive if he consumed water, fish, deer, or other foodstuffs containing radioisotopes. In the case of Sr-90, the isotope would concentrate mainly in human bone, and the significant radiation dose would be to bone. Cesium would distribute primarily in human muscle, and the dose would be to the whole body. Ruthenium and cobalt would not be well absorbed from the stomach or intestines, so that the dose would be to the lining of the gut. Tritium distributes with the body water and produces whole body exposure. Since most of the isotopes have long physical half-lives, the individual ingesting the material would not receive the entire radiation dose immediately. The cesium isotopes, Ru-106 and Co-60 remain in the body a relatively short time (biological half-lives of less than 100 days) so that almost all of the radiation is delivered within the first year after ingestion. Sr-90, on the other hand, becomes more or less permanently bound to bone, so that only 7% of the dose from a given ingestion is delivered during the first year. One must therefore express the radiation dose as the 50 year dose commitment for Sr-90. In the case of the non-strontium isotopes discussed previously, almost all of the radiation is received within the first year so that the dose commitment may be thought of as the annual dose. If an individual ingests radioactivity on a continuous basis, as do those around NFS, the annual dose can be calculated as a series of individual ingestions. If, for example, a person drinks water, every day, containing a certain amount of Sr-90 (in pCi/1), one calculates the total pCi ingested per year, year by year, by multiplying the water concentration (in pCi/1 of water) times the number of liters consumed over the entire year (440 liters on the average). By multiplying this value by the appropriate conversion factor in Table V, the 50 year dose commitment to bone from Sr-90 for that year or that ingestion can be calculated (in millirems per 50 years). If the concentration in meat or fish is known (in pCi/kg), the 50 year dose commitment for any quantity of that material is also readily obtainable. The Bureau of Radiologic Health estimates that a "typical" individual in the vicinity of NFS consumed 5.5 kg (1 kg = 2.2 lbs.) of local fish and 2 kg of local deer meat per year, while the hypothetical "maximum" individual consumes 50 kg of local deer meat and 40 kg of local fish per year. If, for example, one ate 1 kg of fish containing 5,400 pCi Sr-90

per kg of flesh (the maximum value in Buttermilk Creek trout in 1970), the total 50 year dose commitment to bone from that one meal would be 5,400 x 8.4 x 10^{-3} = 45.4 millirems. Approximately 7% of this dose or 3.2 millirems would be received in the first year. If, over the course of the year, such an individual consumed 10 kg of such fish, the dose commitment would be 454 millirems for that year.

Since measurements of concentrations in fish are difficult and time consuming, it is useful to estimate what concentration a fish living in a given body of water is likely to have. In other words, by calculating the maximum amount that a given fish species has been observed to concentrate an isotope from the surrounding water, it becomes possible to estimate the dose received by eating fish taken from that water, knowing only the concentration of the isotope in the water and the amount of fish consumed. It is apparent from Table III that the concentrations of the various isotopes in Cattaraugus Creek are considerably less than in Buttermilk Creek, differing, on the average, by a factor of ten (except for plutonium). However, the concentration in fish flesh, relative to the concentration in the surrounding water (the so-called concentration factor) does not differ markedly between the two Creeks. According to measurements made by the State of New York, the concentration of Sr-90 in the flesh of bottom feeders in Cattaraugus Creek may exceed the concentration in the surrounding water by 22 times. Maximum concentration factors have also been determined for Cs-137, Cs-134, Ru-106, and Co-60 by dividing the maximum fish levels by the maximum water concentrations for that year. Concentration factors derived by this method are quite conservative compared to values reported in the literature. Concentration factors as high as 22,000 have been reported for cesium in freshwater fish, 90 for Sr-90, and 3,450 for Co-60. Tritium is not concentrated by fish, but occurs at approximately the same level in fish as in the surrounding water. The estimated 50 year dose commitment after consumption of a given number of pounds of fish, knowing only the isotope concentration in the water, can be obtained simply by reference to Table VI. Estimated doses could be much higher if the estimated concentration factors, derived from relatively few fish samples, are lower than the actual maximum values as suggested by the literature. With 2,009 pCi of Sr-90 per liter of Buttermilk Creek (1970) and a maximum concentrating factor of 22, the 50 year dose commitment to the bone of a person eating 10 kg (22 lbs) of fish from these waters would be 2008 x 10 x 22 x 8.4 x 10^{-3} = 3,710 millirems, or 3,710 x 7% = 260 millirems per year.

Granted that a worst possible case illustration has been used, it is based on observed concentrating abilities of local fish and observed isotope levels in the discharge creeks. Without firm evidence that edible fish do not migrate from Buttermilk Creek, and realizing that actual maximum concentrating factors may be higher than those given here, it is not unreasonable to ask why standards have not been applied to Buttermilk Creek. The highest recorded value of Sr-90 in the flesh of bottom feeders taken from Buttermilk Creek is 14,456 pCi/kg. Ingestion of one kg of such fish would result in a 50 year dose commitment to bone of 121.4 millirems.

XIII. NEED FOR MORE RIGOROUS STANDARDS

Although these may be extreme instances, the paucity of information on the actual quantity of fish consumed in the region, the migration patterns of fish, and their isotopic concentration make more restrictive standards mandatory. While the new low level waste treatment facility did result in lower levels in the Creeks and fish in 1974, the fact that

the plant will be processing higher burn-up fuel in greater quantities in the future will no doubt reverse this downtrend. It is imperative that more restrictive controls be applied, and that the frequency with which these worst possible cases are actually occurring be accurately determined. Bland reassurances that "our record of performance relative to protection of the public and of our own employees has been successful when measured against permissible standards as authorized in our AEC facility license" and that "On an annual basis, our liquid effluents have ranged from 6-18% of Federal regulations with a typical value of 10%", are numerical half-truths obscuring the degree of contamination that has already occurred. What is important is not only what comes out, or how much relative to such and such a standard, but where it goes and what it does once it gets out. Without independent monitoring by the State of New York, the magnitude of the problem would still be obfuscated. As indicated later in the testimony of Mr. Runion before the Joint Congressional Committee in 1970 (see above), NFS has been nowhere near as successful in controlling omissions as originally anticipated. "We try to maintain as a target in our original design something on the order of less than 5% of the limit. The operating characteristics of the plant, the practical problems that we ran into, have all pushed us above these limits. Fortunately, the plant has not yet operated at a level above 50% of its capacity." And yet, NFS is undergoing a major expansion.

If, as recently recommended by the National Academy of Sciences-National Research Council, the nuclear industry were apportioned only a fraction (say 1/20 – 1/10) of the present maximum permissible population exposures, with the remainder divided up among other sources of radiation exposure, then NFS would be required to limit its emissions

to a small percentage of the 1966-1971 levels. If, for example, the plant could not maintain a Sr-90 level of less than 15-30 pCi of Sr-90 per liter of Buttermilk Creek, it would be in excess of the limit. It is interesting to note that the more modern, Morris, Illinois, and Barnwell, South Carolina reprocessing plants have been designed to emit no liquid effluents. It is not unreasonable to ask why such performance should not be expected of NFS.

XIV. LEAKAGE FROM BURIAL GROUNDS

The low cesium concentrations in the Creeks in 1966 prior to start-up reflect overflow or seepage from the solid waste burial trenches southeast of the plant. These pits are excavated from the ground and filled with undissolved fuel cladding and other low specific activity solid wastes. The solid detritus from 1970 operations filled a single 300,000 cubic foot trench (trench #8) with 150,000 cubic feet of waste containing 40,000 Ci of total beta-gamma activity. The trenches are not covered until full, so that the radioactive materials are often soaked by snow and rain. During 1970, approximately 1,000,000 gallons of water were pumped from trench #8. NFS estimates that this water contained only 40 mCi of activity, i.e. only 1/1,000,000 of the total activity in the trench. However, Erdman's Brook upstream from the processing plant and downstream from the burial site contains significant amounts of activity leached from the burial site, which in turn contributes to the isotopic inventory of Buttermilk Creek. It is estimated that 14% of the cesium in Buttermilk Creek and 20% of the ruthenium derive from the burial site. In recent years, a monitoring station on a small brook northeast of the burial site has also demonstrated some activity indicating either surface drainage or underground seepage in this direction. The isotopic inventory of the burial site is not publicly

available, if it is known, and the rate of migration from the burial site has not been determined. There are no monitoring wells in the vicinity, and the extent of groundwater contamination, if any, and the likelihood of such contamination, are unknown.

XV. RADIOACTIVE CONTAMINATION OF DEER

Contamination of local deer is attributed primarily to deer drinking from the storage lagoons and Buttermilk Creek. Maximum levels of strontium and cesium in deer meat in 1970 and 1971 declined compared to the first three years of operation (see Table VII). Cobalt levels remained relatively constant while tritium content increased. The 50 year dose commitment to persons consuming deer meat containing the maximum levels in 1971 are relatively low. Such meat would produce a 50 year dose commitment to bone of 0.04 millirems per pound of meat, and 0.05 millirems whole body from the Cs-137 and Cs-134. Sr-90 levels in 1968 would have resulted in a 50 year bone dose commitment of up to 2.2 millirems per pound. Whole body irradiation from the maximum tritium content in 1969 would have been 0.09 millirems per pound to the person consuming such meat.

Although no standards exist in this country protecting the wildlife around nuclear installations, observed levels in deer, were they observed in man, would be cause for concern. Assuming a deer weighs 220 pounds (100 kg), and that the tritium content of the entire body in 1971 was the same as that of the meat, the deer could contain up to 693,550 x 100 pCi of tritium. The whole body irradiation to such a deer would be 8.8 millirems. Assuming 30 kg of muscle, the total 1971 cesium (137) content would be 32,840 pCi and the whole body dose 1.9 millirems. At the maximum 1967 Cs-137 level of 66,956 pCi/kg, the whole body dose would have been 120 millirems. It is interesting that

the lower levels of cesium in 1971, relative to 1969 and 1970, are still higher than the levels in Colorado mule deer at the peak of atmospheric fallout in 1963. Alarm over the ubiquitousness of this radioactive contamination of all life forms set the stage for the successful negotiation of the nuclear weapons test ban treaty in 1963. Since that time, Cs-137 levels in Colorado deer have declined to an average of 64 pCi/kg, or twenty times less than in deer around NFS in 1971.

XVI. I-129 CONTAMINATION

I-129 levels in Buttermilk Creek reached a peak of 7.8 pCi/1 in 1971 and declined to 1.4 pCi/1 in the first six months of 1972. Approximately 2% of the I-129 content of spent fuel is discharged in the liquid effluent, and the balance to the atmosphere. The great majority of the vaporized I-129 can be retained on iodine absorbers. However, the plant is permitted to bypass these absorbers if the I-131 content of the fuel is low. Since much of the fuel has been stored for long periods, the I-131 content has been sufficiently low so that the scrubbers have not always been operative during dissolution. The result has been unnecessary discharge of I-129 to the atmosphere. With a half-life of 17 million years, I-129 release constitutes an irretrievable environmental degradation. Most of the I-129 released to the atmosphere is returned to the ground within 20 miles of the plant. The fate of this material once deposited on the ground is largely unknown.

According to the specific activity method, a thyroid gland containing 0.03 microCi of I-129 will receive the maximum permissible annual thyroid dose of 1.5 rems. Assuming a 30 gm thyroid in deer, the 1970 maximum thyroid I-129 concentration of 3700 pCi/gm would deliver 5.6 rems, or almost 4 times the human limit, to the deer thyroid. For-

tunately, deer thyroid is not known to be consumed by most hunters. It is unclear precisely how these deer obtain such quantities of I-129. If a deer took all of its drinking water from Buttermilk Creek with a maximum I-129 concentration of 7.8 pCi/1 the total thyroid I-129 content would only have been on the order of 25 pCi/gm, substantially less than the observed maximum. It is unknown what other sources of I-129 are available to deer and small game in the NFS area. One likely possibility is that I-129 is more extensively distributed in the local food chain than realized. A single seaweed specimen taken from Cattaraugus Creek in 1967 contained 0.81 microCi of I-129 per gram of total iodine, presumably derived from the iodine in the creek system. It is not unreasonable to assume that certain biota in the woods around NFS are retaining and concentrating I-129 from the atmosphere in a similar fashion. Further study is necessary to determine the extent of such contamination.

Nothing is known about the human consumption of I-129 or the concentration in thyroid glands of humans in this area. While the concentration of Cattaraugus Creek in 1971 was approximately 0.6 pCi/1 I-129 in the local water supplies have not been determined. A human drinking 2.2 liters of Cattaraugus Creek water per day would accumulate approximately .00016 microCi of I-129 after one year and receive a thyroid dose of 5 millirems per year.

The State of New York has maintained a milk surveillance network for several years, but has only been able to detect I-129 levels of less than 16 pCi/1 for the past two years. In 1971, the last year for which data are available, the maximum milk I-129 concentration was 1.2 pCi/1 at a farm 1.7 miles east of the plant. Were 1 liter of such milk consumed every day, the annual human thyroid dose would have been 2.7 millirems per year.

XVII. ATMOSPHERIC Kr-85 CONTAMINATION

In terms of the total curies of activity discharged through the plant stack, Kr-85 is the most important nuclide by far. During the 1969 fuel campaigns, an average of approximately 5,000 Ci of Kr-85 were released per day of dissolution, compared with 40-50 Ci of tritium per day. Twenty to 50 Ci of Kr-85 are released during the initial chopping operation, and the remainder during the dissolution step. Kr-85 discharges from the stack reach a maximum around 10 minutes after the start of dissolution, then decrease toward background over the next 3-4 hours. During two days of processing in 1969 (June 12 and 14), the peak atmospheric Kr-85 at the property boundary was 9.3×10^{-6} microCi/cc (or 9,300 pCi/1). The average ranged from 4.8×10^{-7} to 6.4×10^{-8} microCi/cc. The average fence limit is 1×10^{-7} microCi/cc or 100 pCi/1. Actual measurements indicate that by the time Kr-85 reaches the fence, 1500 meters from the stack, it has been diluted by about 42,000 times.

Were the peak of 9300 pCi/1 (achieved during dissolution) to prevail at the boundary throughout the year, the whole body dose in the path of the plume would be 19.3 rem. It is estimated that a 3 hour maximum of this order of magnitude corresponds to a 24 hour average concentration at the fence of 680 pCi/1 which would produce a whole body dose of 1.46 rems per year if the plant dissolved every day. Table VIII summarizes the maximum Kr-85 levels at various monitoring sites maintained by the State of New York in Ashford. Kr-85 levels in Albany, several hundred miles to the east, ranged from .035-.088 pCi/1. The maximum value at Ashford in 1969 was 7.8 pCi/1 which would result in an annual whole body dose of 16.2 millirems if sustained for the entire year. Continuous observations have not been made and the actual exposures to the surrounding population are unknown.

Since a variety of techniques are available for removing Kr-85 from the gaseous effluent, NFS commissioned the Blaw-Know Co. in 1971 to determine the cost of an improved krypton recovery system. Whether the decision has been made to spend the money that such a system would require is unknown. It should be noted that the Environmental Protection Agency has recently concluded that such systems should be required at nuclear power plants. Considering the quantities of higher burn-up fuel that will be processed in the future, it is anticipated that exposures to surrounding populations will increase significantly if such a system is not installed. It has been estimated that a plant processing 6 MTU of 40,000 MED/MTU per day of fuel would release 1.2 Ci of Kr-85 per second compared to an average Kr-85 release rate of .047 ci/sec currently at NFS. If NFS operates at its new capacity of three tons per day when it reopens, Kr-85 releases could increase ten times over current levels, and maximum annual whole body exposures in Ashford would be up to at least 163 millirems per year.

XVIII. ATMOSPHERIC TRITIUM CONTAMINATION

While the amount of tritium discharged to the atmosphere is small compared to the quantity of Kr-85, the radiation dose from the tritium is not inconsequential. Since most of the tritium releases from nuclear facilities are into the liquid waste streams, there has been relatively little attention paid to the atmospheric releases. However it is known that during the 1969 fuel campaigns, 0.6 Ci of tritium emanated from the stack during the processing of batch #13 on June 12 and 0.4 Ci from batch #14 of June 14.

The residual atmospheric tritium from nuclear weapons testing together with naturally occurring tritium in the

stratosphere accounts for the ambient tritium levels of 200-1000 pCi/1 of moisture in air. The concentration of tritium per liter of air is 1.18×10^{-5} times the concentration of tritium per liter of moisture in air.

Stratospheric tritium remains in the atmosphere for long periods, with a mean residence time of 1-10 years, then gradually percolates to lower tropospheric levels where it is rapidly flushed out by rainfall after an average residence time of one month. For local releases, such as from the NFS stack, the downward diffusion of the plume probably results in the tritium depositing on the ground before washout by rain can occur. Approximately 72% of the tritium on the ground is returned to the atmosphere by evaporation and transpiration every year, with the balance migrating by surface runoff and underground seepage.

In a 1967 study at NFS, over 700 air samples were collected over 7 legs radiating from the stack out to a distance of 4 miles. An arbitrary value of 2,500 pCi of tritium per liter of moisture in air was chosen as the upper limit of ambient tritium. 75% of the observed values on the leg extending northwest from the stack exceeded 2,500 pCi/1, as did 20% on the northern and southern radials. The highest recorded value was 26,400 pCi/1. The tritium concentration exceeded 10,000 pCi/1 39% of the time northwest of the plant. Constant immersion, for 365 days, in air containing 2,500 pCi of tritium per liter of moisture in air would produce a dose of less than 0.1 millirems per year, while 10,000 pCi/1 would result in 0.13 millirems whole body exposure, assuming 3 hours of dissolution, 250 days per year.

Springville Dam lies along the northwest radial, approximately 4 miles from the stack and fishermen at the Dam would receive a small whole body exposure from the tritium

in the air, in addition to the atmospheric Kr-85 contribution and the radiation emanating from the radioactive sediments in the Creek bed. The maximum Cattaraugus Creek bank background, in November of 1970, was 0.132 millirem per hour.

The authors of the 1967 tritium study concluded that "it is recognized that much more work needs to be done." Such work remains to be done. Two years later, Mr. Runion, the President of NFS, testified before the JCAE that "airborne contamination has not been a problem at West Valley."

XIX. ATMOSPHERIC PLUTONIUM CONTAMINATION

In addition to significant quantities of krypton and tritium in the air, there are also measurable quantities of the isotopes of plutonium. This material, according to its discoverer and former Chairman of the AEC — Glenn Seaborg — is among the "most toxic" substances known to man. The maximum permissible air concentration (Pu-238) of 0.07 pCi/m³ would produce a maximum permissible exposure to the lungs of 1.5 rems per year. The MPC_a for Pu-239 is 0.06 pCi/m³. Once a person breathes plutonium laden air, a certain portion of the plutonium, determined by the particle sizes, is trapped in the lungs with a biologic half-life of 500 days. For the purposes of the following calculations, it is assumed that only 10% of the plutonium is retained in the lungs. In the opinion of some, 25% is a more reasonable figure. After a certain time, most of the lung plutonium is cleared to the lymph nodes about the lung roots where it remains more or less permanently. The maximum lung radiation is to these so-called hilar lymph nodes.

A small quantity of plutonium persists in the air from nuclear weapons tests, and is characterized by a Pu-239: Pu-238 ratio of much greater than 1, commonly 5-15. Plutonium around the West Valley plant, to be definitely attributed to plant operations, must manifest a Pu-239:Pu-238 ratio of less than 3, or must manifest much higher levels than might be expected from fallout alone. Low burn-up fuel, such as processed in the earlier campaigns, is characterized by a ratio of 1-3, whereas the higher burn-up fuels of later campaigns manifest a ratio of less than 1 (as low as 1:10).

In 1970, the first year in which the State of New York determined Pu ratios in the air of Cattaraugus County, atmospheric plutonium from NFS was clearly detectable beyond the plant confines. Maximum Pu-239 level was .00043 pCi/m³ and Pu-238 .00014 pCi/m³. Assuming an individual breathes 20m³ of air per day, and that 10% of the inhaled plutonium is retained in the lungs, the total 50 year dose commitment from these levels of plutonium would be 26.6 and 41.4 millirems respectively, or a total dose of 68 millirems to the hilar nodes for the 1970 commitment alone. Even higher levels were detected in 1971 but the ratios were such that they could not be clearly attributed to West Valley operations. Plutonium levels in deer lung were first determined in 1971. Maximum Pu-238 in deer lung was 0.72 pCi/kg and Pu-239 0.03 pCi/kg. Assuming 2000 g of lung, the 50 year dose commitment to the hilar nodes of these deer would be 190 and 15.6 millirems respectively. Plutonium concentrations in hilar nodes, rather than whole lung, were not determined.

XX. PLUTONIUM CONTAMINATION OF CREEKS

Plutonium is also present in Buttermilk and Cattaraugus Creeks where the maximum concentrations were 0.78 pCi/1 of Pu-239 and 1.80 pCi/1of Pu-238 in 1971, the first year in which such measurements were reported. Ingested plutonium concentrates mainly in liver and bone in contrast to inhaled plutonium which remains in lung. Had these levels been sustained over the course of the year, and assuming that the deer drank 1000 liters of water from Buttermilk Creek at these levels, the total dose commitment to bone from Pu-239 would have been 4 millirem. Unfortunately deer sampling procedures do not include bone. Neither the Sr-90 nor the plutonium concentration in bone have been determined. Such information would be of considerable value. Plutonium levels in fish and other aquatic biota have also not been determined. It has been learned, from studies on salt water species, that marine forms may concentrate plutonium to many times the levels in the surrounding water. Sargassum, for example, has a concentration factor of up to 21,000. Concentration factors of 600-1000 have been observed in algae and up to 2500 in various zooplankton. Marine vertebrates such as tuna, bass, and tautog concentrate plutonium in bone over 500 times.

XXI. COMPOSITE MAXIMUM HUMAN RADIATION EXPOSURE

Table IX summarizes the maximum dose commitments to a hypothetical individual utilizing maximum observed concentrations in various media during the first five years of NFS operation. This individual is assumed to consume 380 liters of milk, 50 kg of deer meet, 40 kg of fish, and 730 liters of drinking water, per year, and to breath 20 m^3 of air per day, all at the maximum observed concentrations

of the various radioisotopes. It is also assumed that this individual spends 3 hours a day fishing at Springville Dam, 250 days a year, during fuel dissolution. If such an individual is thought to be too hypothetical, it should be pointed out that the maximum isotopic levels in fish were derived from maximum concentrations in fish taken from Cattaraugus Creek and the maximum Kr-85 levels from those observed in Ashford rather than those at the property boundary. Had maximum levels from Buttermilk Creek fish and the property boundary been utilized, the dose commitments would be much higher. For example, the maximum concentration of Sr-90 in the flesh of a sucker taken from Buttermilk Creek in 1970 was 14,456 pCi/kg. Had this fish migrated to Cattaraugus Creek, and been caught by a fisherman at Springville Dam, that individual would receive a 50 year dose commitment to his bone of 55 millirems for each pound of the fish that he consumed. The maximum Sr-90 level in a Buttermilk Creek trout was 5,400 pCi/kg, equivalent to a bone dose commitment of 20.6 millirems for each pound consumed. The bone of this same trout contained 320,000 pCi of Sr-90/kg. If a few fish bones were ingested along with the flesh, each gram of the fish bone would deliver a dose commitment to the fisherman of 2.7 millirems (a single teaspoon will hold 9 grams of ground bone). The maximum Sr-90 content of the bone of a Buttermilk Creek sucker in 1970 was 620,000 pCi/kg, equivalent to 5.2 millirem per gram. It would behoove the fisherman in the vicinity of NFS to filet his fish carefully.

The total bone dose commitment to the maximum individual, including Sr-90 from milk, deer and fish, would be 1,351 millirems. The dose to bone from plutonium is unknown. 7% or 94 millirems of the Sr-90 dose would be delivered in the first year. In addition to the unknown dose from the plutonium isotopes, the commitment from previous year's

Sr-90 ingestion, other bone seeking nuclides, Sr-90 in fish bones, and the bone dose from whole body irradiation would easily exceed 100 millirems, could this dose be determined accurately. If, as suggested in the National Academy of Science-National Research Council report, the emissions from nuclear facilities were limited to a fraction of the total population radiation exposure (say 10%), the predicted dose to the hypothetical maximum individual would exceed the limit.

The postulated maximum individual would accrue a whole body dose of 286.5 millirems, or greater than 50% of the current limit, from consumption of milk, deer, fish containing observed maximum levels of Cs-134 and Cs-137, and tritium, as well as from drinking tritiated water, and breathing air containing tritium and Kr-85. Had the maximum fish levels from Buttermilk Creek been utilized, those doses would have been considerably higher. Although tritium levels in the public water supplies are much lower than in the Creeks, and produce an annual dose of less than 1 millirem, should the hypothetical maximum individual chose to derive his entire drinking water supply from Cattaraugus Creek at its maximum tritium level, he would accrue an additional whole body dose of 17.5 millirems per year. It has also been assumed that this individual spent 750 hours along the banks of Cattaraugus Creek (with an average Creek background of .020 millirem per hour rather than the maximum observed level of .132 millirem per hour) and "maximum" atmospheric tritium and Kr-85 levels.

Should this hypothetical maximum individual be desirous of reducing his radiation exposure he would need to adhere to the following simple guidelines:

(1) DON'T GO NEAR THE WATER.

(2) IF YOU MUST GO NEAR THE WATER, DON'T DRINK THE WATER.

(3) IF YOU MUST FISH IN THE WATER, USE AS LONG A POLE AS POSSIBLE, AND STAND AS FAR BACK FROM THE BANK AS POSSIBLE.

(4) IF YOU CATCH FISH, DON'T EAT THEM.

(5) IF YOU MUST EAT THE FISH, FILET THEM CAREFULLY.

(6) DON'T HUNT THE DEER.

(7) IF YOU MUST HUNT THE DEER, DON'T EAT THE MEAT.

(8) IF YOU MUST EAT THE MEAT, DON'T EAT THE THYROID.

XXII. COMPOSITE MAXIMUM DEER RADIATION EXPOSURE

The maximum hypothetical deer would receive almost 300 millirems whole body per year (Table X), assuming he drank 1000 liters of Buttermilk Creek at maximum tritium levels and inhaled 20m³ of air containing Kr-85 at its "maximum" observed level in Ashford. The tritium contribution would be 8.9 millirems per year, Cs-137 120.5, Cs-134 29.6, Sr-90 136.9, and Kr-85 1.4. At the maximum observed thyroid I-129 concentration, the thyroid dose would be 5.6 rems per year which exceeds the maximum human limit of 1.5 rems by 3.7 times. The bone dose, from plutonium at maximum observed levels in Buttermilk Creek, would be approximately 1 millirem from Pu-239. The bone dose from Sr-90 ingestion at maximum Buttermilk Creek levels could be up to 16.7 rems for a total bone dose commitment of 16.8 rems per year. Assuming 7% of the Sr-90 and 2% of the plutonium dose commitment is delivered in the first year, the

annual bone dose would be approximately 1,176 millirems, or 2.8 times the maximum bone dose permitted humans. Unfortunately, deer taken from the NFS site have not been analyzed for bone Sr-90 and plutonium content.

It is apparent that the failure to include the wildlife in the radiation exposure considerations has resulted in substantial irradiation of deer and probably other denizens of the woods around NFS. Without compelling reasons to the contrary, it is illogical not to apply the same standards to wildlife as to humans. The fallacy of such an oversight should be self-explanatory, and is strongly reinforced by the excessive thyroid and bone doses calculated for local deer. Although cesium and strontium levels declined during 1970 and 1971, they can be anticipated to increase in the future. The estimated maximum exposures may well be exceeded in the future if standards are not applied to wildlife. I-129 levels will certainly increase unless stack discharges are controlled. Tritium levels, and resulting whole body exposure, will increase inexorably.

TABLE I.

Radionuclide Content of light water reactor fuel decayed 150 days.

Nuclide	Concentration (curies/metric ton)	Nuclide	Concentration (curies/metric ton)
^{3}H	692	^{131}I	2.17
^{83}Kr	11,200	^{132}I	—
^{89}Sr	96,000	^{133}Xe	—
^{90}Sr	76,600	^{134}Cs	213,000
^{90}Y	76,600	^{136}Cs	20.8
^{91}Y	159,000	^{137}Cs	106,000
^{95}Zr	276,000	^{140}Ba	430
^{95}Nb	518,000	^{140}La	495
^{99}Mo	—	^{141}Ce	56,7000
^{99m}Te	—	^{144}Ce	770,000
^{99}Te	14.2	^{143}Pr	694
^{103}Ru	89,100	^{147}Nd	51.0
^{106}Ru	410,000	^{147}Pm	99,400
^{103m}Rh	89,100	^{149}Pm	—
^{111}Ag	—	^{151}Sm	1150
^{115m}Cd	44.3	^{152}Eu	11.5
^{124}Sb	86.3	^{155}Eu	6370
^{125}Sn	20.0	^{160}Tb	300
^{125}Sb	8130	^{239}Np	17.4
^{125m}Te	3280	^{238}Pu	2810
^{127m}Te	6180	^{239}Pu	330
^{127}Te	6110	^{240}Pu	478
^{129m}Te	6690	^{241}Pu	115,000
^{129}Te	4290	^{241}Am	200
^{132}Te	—	^{242}Cm	15,000
^{129}I	0.038	^{244}Cm	2490

Source: ORNL-1451

TABLE II

Total annual liquid releases according to figures provided the JCAE by NFS in 1970

	1966 (Ci)	1967 (Ci)	1968 (Ci)	1969 (Ci)
Gross alpha	.038	.056	.139	.376
Gross beta	8.265	30.70	46.400	136.100
Tritium	289.520	4204.000	2612.000	5980.000
Sr-90		4.366	5.03	5.289
I-129		.070	.023	.184

TABLE IIIa

Maximum isotopic levels in Buttermilk Creek 1966-1970 in pCi/l (State of New York data)

	Tritium	Sr-90	Cs-137	Ru-106	I-129	Pu-238	Pu-239
1966			1				
1967			100				
1968	1,133,920	1,015	666				
1969	431,010	1,658	1,161	5,816		0.63	0.60
1970	1,185,290	2,008	972	3,917		2.40	1.90
1971	1,480,630	1,841	692	10,875	7.8	1.80	.078
1972	90,200	337	41	3,846	1.4	.23	.08

TABLE IIIb

Maximum isotopic levels in Cattaraugus Creek at Springville Dam 1966-1972 in pCi/l (State of New York data)

	Tritium	Sr-90	Cs-137	Ru-106	I-129	Pu-238	Pu-239
1966			1				
1967			10				
1968	110,430	60	20				
1969	98,600	224	86	421		0.64	1.36
1970	103,770	291	197	782		3.60	2.20
1971	184,510	117	29	481	0.6	.016	.014
1972	9,090		119				

TABLE IVa

Maximum isotopic levels in Buttermilk Creek bottom feeders 1965-1971 in pCi/kg (New York State data)

	Sr-90	Cs-137	Co-60	Cs-134	Ru-106
1965		1,685			
1966	81				
1967	15,300	27,500	340	5,750	1,750
1968	22,800	13,400	342	3,140	2,990
1969	5,668	6,032	242	689	3,611
1970	14,456	34,835		5,890	
1971		4,659		742	

TABLE IVb

Maximum isotopic levels in Cattaraugus Creek at Springville Dam in bottom feeders 1965-1971 in pCi/kg (New York State data)

	Sr-90	Cs-137	Co-60	Cs-134	Ru-106
1965		23			
1966	1,035				
1967	906	3,610	32	499	796
1968	3,080	1,330	382	1,170	155
1969	1,400	3,141	95	1,547	389
1970	1,679	3,198		534	
1971	45	1,666	23	301	

TABLE IVc

Maximum isotopic levels in Buttermilk Creek surface feeders (trout, bass, pike) 1969-1970 in pCi/kg (New York State data)

	Sr-90	Cs-137	Co-60	Cs-134	Ru-106
1969	3,577	6,210		670	
1970	5,400				

TABLE IVd

Maximum isotopic levels in Cattaraugus Creek surface feeders (trout, bass, pike) 1967-1970 in pCi/kg (New York State data)

	Sr-90	Cs-137	Co-60	Cs-134	Ru-106
1967		2,100	8	390	
1968	41	591	646		2,511
1969	272	722		268	
1970	301	2,608		453	
1971	5	315			

TABLE V

Target organ and dose per pCi of each isotope consumed (multiply concentration in media consumed in pCi/1 or pCi/kg by column 4 to obtain 50 year dose commitment).

Isotope	Target organ	method of consumption	millirem/50 years per pCi of intake (conc in pCi/1 of water, food or air)
Sr-90	Bone	ingestion	8.4×10^{-3}
Pu-239	Bone	"	1.2×10^{-3}
Cs-137	whole body	"	0.06×10^{-3}
Cs-134	"	"	0.08×10^{-3}
Ru-106	GI tract	"	0.195×10^{-3}
Co-60	"	"	0.04×10^{-3}
Tritium	whole body	inhalation and skin submersion in air	1.86
Kr-85	"	"	2.08
Pu-238	Hilar lymph nodes	inhalation	132
Pu-239		"	260

TABLE VI

Estimated radiation dosage from consuming x pounds of fish flesh from Buttermilk or Cattaraugus Creeks knowing only the water concentration of the isotope of interest

Isotope	Target organ	Maximum concentration factor in bottom feeders	Maximum concentration factor in surface feeders	Multiply water concentration in pCi/1 by this conversion factor number of pounds of fish consumed to obtain 50 year dose commitment for bottom feeders	Multiply water concentration in pCi/1 by this conversion factor number of pounds of fish consumed to obtain 50 year dose commitment for surface feeders
Sr-90	Bone	22	4.6	.08	.017
Cs-137	WB	54	13.2	.0015	.0036
Cs-134	WB	25.3	2.7	.00092	.000098
Ru-106	GI	3.0	25.1	.00027	.0023
Co-60	GI	95.5	161.5	.0017	.0029

TABLE VII

Maximum isotopic levels in NFS deer 1967-1971 (New York State data) in pCi/kg

	Sr-90	Cs-137	Cs-134	Co-60	tritium	thyroid I-129 (pCi/gm)
1967		66,956	12,313	151	46,300	
1968	543	3,793	592	< 15		
1969	95	8,587	2,046	< 15		1,200
1970	28	4,687	784	56		3,700
1971	10	1,428	314	< 15	685,550	1,400

TABLE VIII

Kr-85 levels in air in pCi/m³ 1969-1971 at Ashford and Albany (NY State data)

			average	maximum
1969	Ashford			
		Site A054145		7,860
		Site A045114		2,640
	Albany		21	88
1970	Ashford			
		Site A045145		1,640
		Site A045144		221
	Albany		19	37
1971	Ashford			
		Site A045143	1,425	
		Site A045114	137	1,516
	Albany		18	35

TABLE VIIII

Radiation dose to composite "maximum" individual exposed to maximum observed concentration of various waste products released from NFS during the first five years of operation

Nuclide	Target organ	medium	maximum concentration pCi/l or /kg	dose commitment in millirems	Total commitment in millirems
Sr-90	bone	milk	28	89	
		deer	543	227	
		fish	1679	564	
Pu	Bone	water	?	?	870
Cs-137	Whole	milk	120	2.7	
	Body	deer	67000	200	
	"	fish	3600	8.6	
Cs-134	"	deer	12313	48	
	"	fish	1550	5	
tritium	"	milk	2500	0.3	
	"	deer	683550	4.4	
	"	fish	92255	1.0	
	"	air	.12	.13	
sediments	"	bank of Cattaraugus Creek	.020 milli-R/hr.	15	
Kr-85	"	air	7.8 pCi/m³	1.4	286.5
tritium	"	drinking Cattaraugus Creek water	184,310	17.5	
I-129	thyroid	milk	1.2	2.7	

TABLE X

Radiation dose to composite "maximum" deer exposed to and containing maximum observed concentrations of various waste products released from NFS during the first five years of operation

Nuclide	Target organ	concentration in	maximum concentration pCi/l or /kg	dose commitment in millirems	Total dose commitment in millirems
Sr-90	bone	bone	unknown	?	
Pu-238	"	"	"	?	
Pu-239	"	"	"	?	
Sr-90	whole	muscle	543	136.8	
Cs-137	body	"	66956	120	
Cs-134	"	"	12313	29.5	
tritium	"	"	683550	8.8	
"	"	air	.12	.13	
Kr-85	"	"	7.8 pCi/m³	1.4	
sediments	"	creek banks	?	15	311.6
I-129	thyroid	thyroid	3700 pCi/gm	5600	
Pu-238	hilar	lung	.72	190	
Pu-239	nodes	"	.03	15.6	

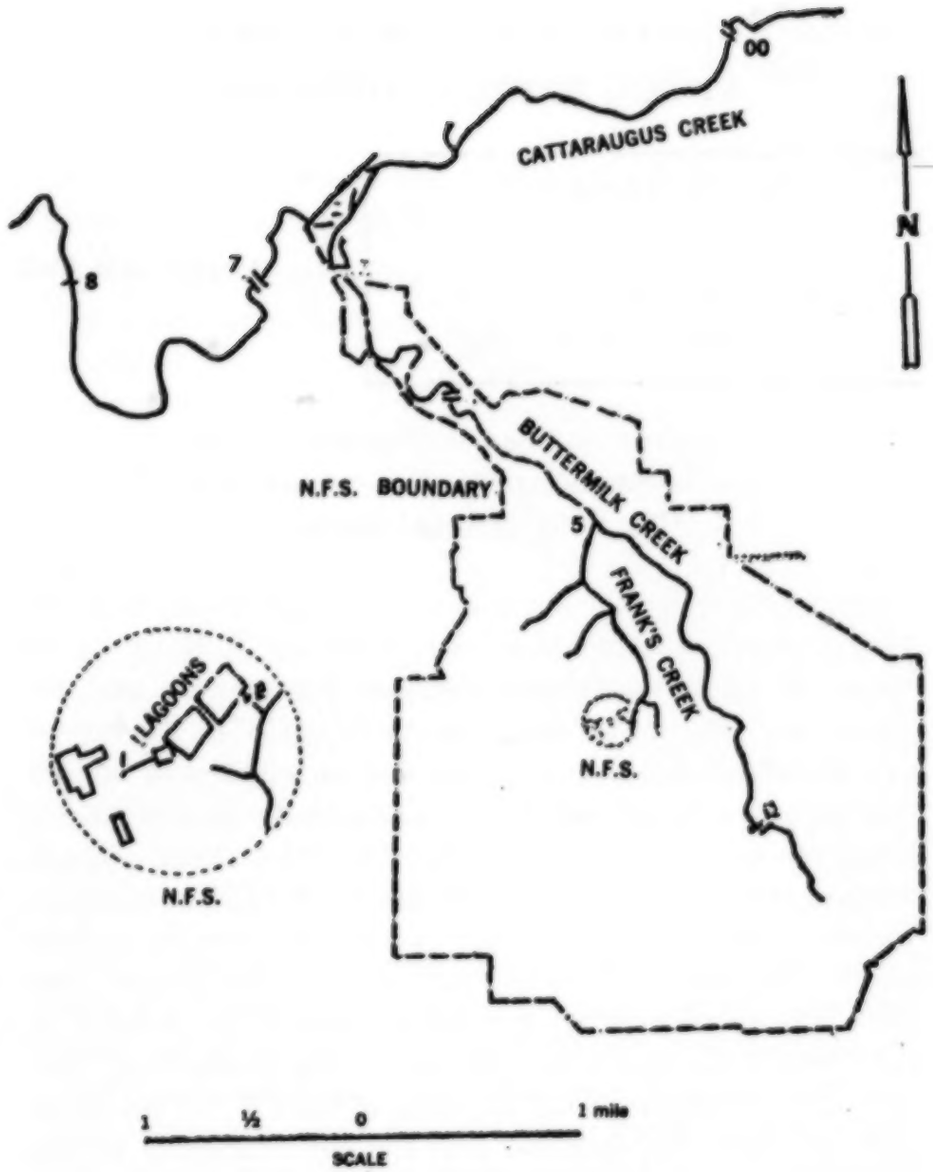

FIGURE I. Map of NFS fuel reprocessing facility, and drainage creeks.

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In the Matter of:	Docket RM 50-3
Rule Making Hearing on Environmental Effects of The Uranium Fuel Cycle	

Comments of General Electric Company on the Supplementary Comments by the Union of Concerned Scientists

General Electric Company has reviewed the subject filing of March 19, 1973 made by Mr. Anthony Z. Roisman on behalf of the Consolidated National Intervenors and the Union of Concerned Scientists ("CNI/UCS"). Based on our review of this document we find no additional factual evidence that would negate or substantially alter the basis proposed by the Commission for the rulemaking. These filings certainly do not support the CNS/UCS opinion expressed at the hearing in favor of a moratorium on nuclear power. In fact, we believe that viewed in the proper context these supplementary comments support the position of the Commission and other parties to this proceeding, that there are suitable answers for some of the difficult problems such as waste disposal and that the environmental effects of the fuel cycle are indeed "small" and "insignificant". Dr. Pittman testified at the hearing that a thorough evaluation is being made of various concepts for long range storage of high level wastes (Tr. 114). The CNI/UCS filing in detailing some of the primary alternatives, is clearly merely supportive of the Staff position rather than critical. While we rejoice at their general endorsement of the Staff

it is a matter of disappointment that it has been necessary to wait so long for the CNI/UCS to support the Staff position.

In addition, we would like to make the following specific comments on the CNI/UCS filing:

(1) The supplementary comments are based on facilities which have been in existence for several years and which do not yet employ the latest technology for reducing emissions and other potential environmental impacts. For example The Midwest Fuel Recovery Plant converts its high activity waste directly to a solid form rather than utilizing interim liquid waste storage. Therefore we believe as previously stated in our other submissions that actual environmental impacts will be substantially less than those indicated in the Commission's Environmental Survey. Also the Supplementary Comments of CNI/UCS greatly exaggerate the potential impact of releases from such facilities by assuming that maximum concentrations exist for an entire year and that personnel are continuously exposed. Such an approach simply is not a realistic method of estimating environmental effects.

(2) The Supplementary Comments appear to advocate the position that any calculable impact, however small, must be prohibited without any consideration of cost benefit analysis. For example, they call for immediate elimination of Kr-85 emissions without any consideration of the vast data as to the infinitesimal contribution of that isotope to radiation exposure in relation to naturally occurring sources of radiation exposure that have existed since time began.

We do not believe that such drastic restrictions are appropriate without objective assessment of their overall real impact on the quality of life and the environment.

We trust that these comments will be helpful to you in further consideration of this rulemaking proceeding. Copies of the comments have been sent to the parties shown on the attached list.

Respectfully submitted,
GENERAL ELECTRIC COMPANY
C. W. SMITH, *Manager*
Licensing & Transportation

CWS:rj

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF	
AMENDMENT OF 10 CFR PART 50 — LICENSING OF PRODUCTION AND UTILIZATION FACILITIES (Environmental Effects of the Uranium Fuel Cycle)	Docket RM 50-3

NEW YORK STATE ATOMIC ENERGY COUNCIL COMMENTS ON SUPPLEMENTARY COMMENTS BY THE UNION OF CONCERNED SCIENTISTS ON "ENVIRONMENTAL SURVEY OF THE NUCLEAR FUEL CYCLE"

Introduction

On March 19, 1973, Consolidated National Intervenors/ Union of Concerned Scientists filed "Supplementary Comments." This document has been reviewed by members of the New York State Atomic Energy Council, and the comments contained herein are solely for the purpose of clarifying the record.

GENERAL COMMENTS

1. The Report does not recognize that there are two separate activities at the NFS West Valley Site.

(a) The processing plant and its associated burial pits —

This plant and the burial pit activities are licensed by the U.S. AEC. These burial pits (slightly south-

east of the plant) are used for disposal of high activity solid wastes and fuel hulls.

This plant began processing fuel in 1966.

(b) A commercial low level burial facility that is operated by NFS but is totally separate from the processing plant —

This facility is located southeast of the processing plant and adjacent to the pit burial area described in (a) above. The low level burial facility is licensed by New York State and the activities of the facility are monitored and inspected by appropriate New York State agencies.

2. This Report does not properly reflect that the New York State monitoring program has in the past and will in the future provide the basis for insuring that the 10 CFR 20 requirements are appropriately used to protect the public health and welfare.

3. This Report does not properly reflect the upgrading of the processing plant facilities that have already occurred or others that are scheduled and under construction at the present time. The upgrading of facilities coupled with the intensive monitoring program, provides the bases for future planned Site operations with reasonable assurance for a safe environment for the surrounding populus.

4. The Report indicates that the "specific" site soil characteristics are unknown or have not been evaluated. A series of soil tests were evaluated prior to the establishment of the plant and prior to the establishment of the low level burial facility. The extensive investigation of soil characteristics provides a high degree of assurance that these characteristics are known and that any migration from the

burial pits or the commercial burial trenches is insignificant. To date, there is no evidence of radioactive releases as a result of underground seepage from the burial facilities. There are indications that some minor amount of surface contamination may be occurring at the commercial burial facility.

There is verification that internal plant leakage of radioactive material has occurred. This is based on measurements of the sewage plant effluent activity levels. The effluent is discharged into the stream that flows past the burial area. The discharge point is upstream of the burial area.

There is a small amount of activity released in a controlled manner from a lagoon near the commercial burial trench area. Water collected in the open trench is pumped into this lagoon where it is monitored and then released. The pumping of this water has been used to maintain a dry working condition at the open end of the trench.

5. The measured fish activities listed in Table IVa through IVd yield very consistent results. These results indicate clearly that the activity levels in fish samples from the Cattaraugus Creek are substantially less than the fish samples from Buttermilk Creek. In particular, the highest isotopic entries show large decreases from Buttermilk Creek to Cattaraugus Creek. This indicates that the importance of higher isotopic levels in Buttermilk Creek is not necessarily associated directly with Cattaraugus Creek. The fish samples collected from Buttermilk Creek have indicated that the fish residing within the site boundary are smaller than normally consumed (eaten) and include primarily rough fish types. Since fishing within the site boundaries is prohibited, and given the small size of the fish normally inhabiting the site waters, the use of fish activity

levels to postulate effects on humans based on Buttermilk Creek samples is very conservative.

6. Section XIV of this Report presents a very confused description —

(a) There has been no overflow or lateral seepage of material from the commercial trenches to date that can be identified. Water has been pumped from the open trenches to a nearby lagoon where it is monitored for radioactivity and released in a controlled fashion. The low Cesium concentrations prior to 1966 referred to in the Report are probably from weapons testing fallout.

All low specific activity solid wastes from the NFS plant have been placed in the commercial burial area. The quantity of low level material from the processing plant placed in the commercial facility during 1970 is estimated to be approximately 42,000 cu. ft. The remainder of the 1970 material (approximately 80,000 cu. ft.) placed in the trench originated offsite. The trench being utilized for burial is progressively filled and covered. At any one time only 10 to 30 ft. of low level material placed in a trench remains uncovered. However, all material is packaged such that it is not directly exposed to the atmosphere. The Report is confused in associating the commercial burial facility with the processing plant and its associated burial pits.

The burial pits (under U.S. AEC license) are located adjacent to the commercial trench burial site and have been used for disposal of undissolved fuel cladding and other high specific activity solid waste. On one occasion, a small release from this area was monitored.

The rate of water migration through the soil at the NFS site was predicted by lab tests and soil sample analyses, and there is no evidence (based on soil borings and soil tests) that would support the likelihood of significant underground migration of radioactivity from the burial area.

New York State can no longer support the statement that "an estimated 14% of the Cesium and 20% of the Ruthenium found in Buttermilk Creek originates from the burial site".

(b) This Report presentation attempts to set the stage for the future by predicting that extrapolation of past releases can be used to accurately represent future releases. This fails to recognize that:

(i) Control of effluents has been and will be continued to insure the safety and health of the public;

(ii) U.S. AEC guideline limits of exposure to people have not been in the past and will not be in the future allowed to be exceeded.

SPECIFIC COMMENTS

7. Page 3.2, Par. 8 — There is no indication of "seepage" through the soils from the pits or commercial trenches. Lagoon water discharges are controlled and monitored.

8. Page 3.6, *First Par.* — Undissolved cladding hulls and other high specific activity solid wastes are buried in pits located just southeast of the processing plant in accordance with U.S. AEC license requirements.

Second par. — Reference to a 1960 fuel campaign is either a typographical error or occurred at a location other than NFS.

9. Page 3.13 — The concentration limits listed on page 3.13 apply only to liquid effluents and in no way reflect limits on concentrations in drinking water.

10. Page 3.13 — The Report refers to a maximum permissible radiation dose of 500 millirem per year to bone from Sr-90, Pu-238, and Pu-239.

The correct maximum allowable dose to bone is approximately 2800 millirem per year from these elements.

11. Page 3.17 — No 7,000 ft. well has been drilled at the NFS site. Furthermore, the Oak Ridge National Laboratory study of 1971 was not conducted to evaluate the feasibility of Tritium disposal into a 7,000 ft. deep well. This study involved drilling a 1500 ft. hole and injecting a slurry with a radioactive tracer for evaluation of the shale fracturing technique for waste disposal.

12. Pages 3.16 and 3.17 — Reference is made to a survey monitoring site upstream from NFS showing "seepage" from the burial area. This is an unsupported conclusion. New York State has no definitive knowledge of seepage from the burial grounds to date. Further evaluation of possible Tritium migration is being planned.

13. Page 3.17 — The Report states that it is only a matter of time until detectable contamination of ground water occurs. This is an unsupported statement and is contrary to the test results of the site relative to soil characteristics. There is no identifiable basis that leads to a prediction of underground contamination of water outside the site boundaries.

14. Page 3.22 — The statement in the Report that activity levels in creeks will increase due to future processing of higher burn-up fuel in greater quantities, does not recognize that New York State will continue to monitor and if necessary (with the cooperation of the U.S. AEC) restrict activities at the site to prevent activity levels that would endanger the populus in the vicinity of the site. In addition, there is no recognition of the updating of NFS facilities already installed or under construction that would control the release levels.

15. Page 3.26 — The Iodine 129 releases have been recognized and facilities to insure that it is no longer released in significant amounts from the plant are under construction.

16. Page 3.37 — The 8-point fixed guidelines represent mechanisms that could be used to reduce potential exposure of people, whether the fish, water or deer were slightly contaminated or highly contaminated. Based on results to date, there is no reason to believe that any individual residing in the vicinity of the site would receive exposures higher than Federal recommended guideline dose values if he violates all the UCS guidelines listed.

17. Figure 1, Page 3.50 — The Report refers to items on this Figure that are either incorrectly displayed or not identified. These include:

(a) Erdman Brook — not identified.

(b) The two separate burial facility locations are not identified.

Respectfully submitted,

J. Bruce MacDonald
Counsel, New York State
Atomic Energy Council

Dated at Albany, New York
this 13th day of April, 1973

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF	
AMENDMENT OF 10 CFR PART 50 — LICENSING OF PRODUCTION AND UTILIZATION FACILITIES (Environmental Effects of the Uranium Fuel Cycle)	Docket No. RM 50-3

CERTIFICATE OF SERVICE

I hereby certify that copies of "New York State Atomic Energy Council Comments on Supplementary Comments by the Union of Concerned Scientists on 'Environmental Survey of the Nuclear Fuel Cycle'" have been served on the following by deposit in the United States mail, first class, on the 16th day of April, 1973:

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UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION
April 13, 1973

In the Matter of	Docket No.
AMENDMENT OF 10 CFR PART 50 — LICENSING OF PRODUCTION AND UTILIZATION FACILITIES (Environmental Effects of the Uranium Fuel Cycle)	RM-50-3

RESPONSE OF 14-MEMBER UTILITY GROUP TO "SUPPLEMENTARY COMMENTS" OF CNI-UCS

The 14-Member Utility Group submits herewith its response, prepared with the assistance of Dr. Leonard Geller of The S. M. Stoller Corporation, special consultant to the Utility Group in connection with this proceeding, to the CNI-UCS "Supplementary Comments" filed March 19, 1973.[1] The CNI-UCS Supplementary Comments addressed only two issues: high-level waste storage and the radiological effects of the NFS fuel reprocessing plant.[2]

That portion of the Supplementary Comments regarding high-level waste storage consists of an outline of various alternative methods of storing and disposing of such

[1] In the "Request of 14-Member Utility Group for Time to Review and Respond to CNI-UCS 'Supplementary Comments'", we asked to be allowed until April 16, 1973 to review the Supplementary Comments and to respond thereto. By telegraphic order dated March 29, 1973, the Board granted our request.

[2] Some subjects which the Board had requested CNI to address in its Supplementary Comments were not covered. See e.g., Tr. at 291 (Dr. Steindler expressed the hope that in light of the CNI-UCS approach to the question of accident analysis, CNI-UCS could address the shortcomings which CNI-UCS sees in the Fuel Cycle Survey's accident analysis.)

wastes. CNI-UCS favors the alternative of separating the transuranics and actinides from the fission products and subjecting the transuranics and actinides to transmutation. The outline of alternatives could serve as a primer for those who may be unacquainted with the high-level waste storage issue. As we note herein, the CNI-UCS transmutation recommendation is one that has been and is being considered by the Commission. While the CNI-UCS comments regarding high-level waste storage may be of some limited usefulness in providing background information, they are not relevant to the issues involved in this proceeding. This rule making is concerned with two questions: (a) the accuracy of the Survey's calculation of the environmental effects of the uranium fuel cycle and (b) the method by which those calculated environmental effects are to be taken into account in the licensing of light-water-cooled nuclear power reactors. The Hearing Board is not charged with the duty of setting broad Commission policy regarding high-level waste storage nor is this rule making concerned with the question of which alternative method of storing and disposing of high-level waste should be adopted.[3] While we would be pleased to debate the merits of the CNI-UCS transmutation recommendation in the proper forum, we do not believe the purpose of this proceeding would be advanced by engaging in that tangential debate now. However, we have briefly addressed, in the attached comments, certain statements of CNI-UCS regarding the waste management question which we believe are unduly exaggerated.

With respect to the CNI-UCS comments regarding the NFS fuel reprocessing plant, significant modifications made and being made to the NFS plant will significantly reduce

[3] There are fora available to CNI-UCS in which it can argue its transmutation recommendation. For example, the JCAE recently held hearings on the AEC waste management program. Apparently, however, no nuclear critics requested an opportunity to participate in those hearings and reportedly none attended the hearings.

the discharge of radioactive elements, such as Cs-137, Sr-90 and I-129, about which CNI-UCS has expressed concern. These modifications are alluded to by CNI-UCS in the Supplementary Comments but the significance of such modifications was not discussed therein. Equally important, as we point out in greater detail herein, is the fact that even absent such modifications the radiation exposure from the NFS plant would be significantly lower than the exposure calculated in the CNI-UCS Supplementary Comments. In any event, the NFS plant is atypical of current reprocessing operations and will provide only a part of the total reprocessing capacity available in the near future. The CNI-UCS Supplementary Comments thus fail to treat the NFS plant in the proper perspective — *i.e.*, in the context of the total reprocessing industry.

Thus, our final review confirms our initial assessment that the Supplementary Comments raise no major, critical questions and adduce no significant factual data which controvert the validity of the Fuel Cycle Survey.

Respectfully submitted,

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Consumers Power Co.
General Public Utilities Corp.
Long Island Lighting Co.
New England Electric System
Northeast Utilities Co.
Pacific Gas and Electric Co.
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REVIEW OF CNI-UCS SUPPLEMENTARY COMMENTS

I. REVIEW OF CHAPTER 2 ENTITLED "STORAGE AND DISPOSAL OF HIGH LEVEL WASTES"

Chapter 2 of the Supplementary Comments consists merely of a review of the current effort to deal with the storage and disposal of high-level wastes and an outline of various alternatives which might be considered. CNI-UCS favors separation of transuranics and actinides from the fission products and transmutation of the former — an alternative which has been and is being considered by the AEC. The CNI-UCS review and outline is not particularly relevant to this proceeding; however, Chapter 2 does contain certain statements which we feel are deserving of reply.

For example, at 2.2 of the Supplementary Comments, CNI-UCS claims that the current AEC program for storage and disposal of nuclear wastes is 'reminiscent" of developments associated with the production of plutonium for the weapons program: "Hasty and, in part, seriously incorrect decisions were made regarding the storage of wastes produced by a technology alleged to be currently necessary." We do not believe that the Commission's program can accurately be characterized as encouraging hasty decisions regarding the ultimate disposal problem. On the contrary, the approach being followed by the Commission — putting the wastes in a solidified form so that they can be conveniently handled and stored in an Engineered Storage Facility (ESF) until the ultimate disposal question is resolved — removes the pressure that might otherwise exist to make hasty decisions about ultimate disposal. Moreover, the ESF will provide an added measure of protection since the flow of high-level wastes is not expected to become appreciable until the early 1980's and storage at reprocessing plant sites, even as liquid wastes in stainless steel tanks, is a

feasible, demonstrated technique to use until another technique, meeting the long-term objectives, is established.

As far as the notion that "seriously incorrect decisions" were made in the storage of wastes from the weapons program, we interpret this as referring to the use of carbon steel tanks, particularly single tanks, for much of the storage capacity at Hanford and Savannah River. Actual experience over more than 25 years has shown that the leaks from these tanks (which the testimony considers further on page 2.14) have not caused any harm to site personnel or to the public. Moreover, the initial use of these single tanks has not precluded their replacement by improved designs as the need for additional capacity has developed. No irrevocable decisions affecting the environment have been made by their use.

Neither do we believe that the possible lack of a satisfactory method to decontaminate the carbon steel tanks is adequate reason to classify the use of such tanks as a "serious mistake". The potential adverse environmental effects are sufficiently remote that such tanks may be justified even after a strict NEPA cost-benefit analysis, as demonstrated by the recent (Dec. 1972) Environmental Statement submitted for Future High Level Waste Facilities at Savannah River. (1) In this report, four carbon steel tanks, each having a capacity of 1.3 million gallons, are proposed for construction to hold the alkaline wastes from future processing operations. The carbon steel tanks are shown to have a higher benefit-cost ratio than would the use of acid wastes and stainless steel tanks.

At page 2.9 of the Supplementary Comments, CNI-UCS states:

> "Plutonium (Pu) is perhaps the most toxic element known and represents a chronic biological hazard on a weight basis comparable to the acute hazard from *botu-*

linus toxin, i.e., it is hazardous at 10^{-6}g, if appropriately deposited in lungs or bone (5). 239Pu in equilibrium with its daughters has a direct radiological hazard about 10,000 times that of natural uranium in equilibrium with its daughters (6)."

There is no question that Pu-239 and its decay products are highly hazardous materials and must be treated with the careful attention they deserve. But the article by A. Weinberg (2), referred to in the above quote from the Supplementary Comments, gives some perspective regarding Pu-239's toxicity. In referring to what might happen if the worst foreseeable catastrophe should strike the salt mine containing the high-level wastes accumulated from now until the year 2000, Weinberg says:

"The mine would contain 38 tons of ^{239}Pu mixed with about a million tons of nonradioactive material. The plutonium in the cans is thus diluted to 38 parts per million; since plutonium is, per gram, 10,000 times more hazardous than natural uranium in equilibrium with its daughters, these diluted waste materials would present a hazard of the same order as an equal amount of pitchblende. Actually, the 38 tons of ^{239}Pu is spread over 200 acres. If all the salt associated with the ^{239}Pu were dissolved in water, as conceivably could result from total flooding of the mine, the concentration of plutonium in the resulting salt solution would be well below maximum permissible concentrations. In other words, by virtue of having spread the plutonium over an area of 200 acres, we have to a degree ameliorated the residual risk in the most unlikely event that the mines are flooded."

This same point — that the toxicity of plutonium may be diluted to a point where it is comparable to that of other natural background elements — has also been made by Julius H. Rubin, AEC Assistant General Manager for Environment and Safety, in discussing waste disposal (3):

"In terms of long half-life and high specific radiotoxicity, plutonium-239 is comparable to radium-226. The current maximum permissible body burden for plutonium in bone

is two and one-half times more restrictive than that for radium. The concentration standard for water is 500 times more restrictive for radium than for plutonium. The half-life of plutonium is 15 times as long as that of radium. However, the half-life of radium is only relevant to specific isolated quantities; the radium content of the earth's crust in general is maintained by the decay of uranium-238, with a half-life about 2×10^5 times as long as that of plutonium. In view of the long periods of time involved in this general problem, estimation of an exact 'relative hazard factor' seems unwarranted. Radium is widely dispersed through the earth's crust, frequently near the surface. The resultant concentrations of radium in natural waters are often detectable but are generally well below drinking water standards. It seems reasonable, therefore, to bury plutonium — not at random, but at carefully selected sites — in concentrations in the upper range of natural radium concentrations in the earth. The actual value proposed is ten nanocuries per gram of waste."

Thus, plutonium may be stored and disposed of in such a manner as to represent no greater threat than other naturally occurring elements.

References:

(1) WASH-1528 "Draft Environmental Statement — Future High Level Waste Facilities" — Savannah River Plant — Aiken, South Carolina, Dec. 1972-USAEC

(2) A. M. Weinberg, Science 177, 27 (1972)

(3) J. H. Rubin, "High-Level Radioactive Waste Management in the U.S.", IAEA Panel to Examine the Possibility of Establishing International Storage Sites for High-Level and Alpha Bearing Radioactive Wastes, Nov. 20-24, 1972 — Vienna, Austria.

II. REVIEW OF SECTION 3 ENTITLED "RADIOLOGICAL IMPACT OF WEST VALLEY REPROCESSING PLANT"

It is interesting that CNI-UCS has focused upon data associated with the NFS plant. As EPA has pointed out in a recent (August 1972) report, "Estimates of Ionizing Radiation Doses in the United States — 1960-2000", the NFS reprocessing operation "is not considered typical of future plants" (p. 32). Indeed, the Fuel Cycle Survey itself makes clear that the NFS plant is atypical of the industry, since "only the NFS plant releases radionuclides in liquid effluents" (p. F-25). Furthermore, as the Fuel Cycle survey points out, not only is the NFS plant atypical of current reprocessing operations, but it will provide only a fraction of the total reprocessing capacity available within the near future. Thus, the CNI-UCS focus upon only the NFS plant is not particularly helpful in forming a clear assessment of the environmental effects of the reprocessing phase of the uranium fuel cycle. Even if the additional adverse environmental effects postulated by CNI-UCS with respect to the NFS plant were correct, the additional contribution of such effects must be viewed in the context of the total reprocessing industry.

While the CNI-UCS focus upon the NFS plant represents a distorted perspective, that distortion is compounded by the methodology used in calculating the anticipated radiological impact of the plant. Most importantly, CNI-UCS relies upon the earlier historical data of NFS and suggests that the discharge levels during this earlier period will continue. (It is worth noting that the NFS discharges never exceeded the then applicable discharge envelope, nor does CNI-UCS so allege.) Yet, as CNI-UCS itself notes, a number of improvements have been made to the plant (most

notably, a new Low Level Waste Treatment facility) which will reduce the discharge levels. But while CNI-UCS refer to these improvements, their effect in reducing radionuclide discharge levels is never discussed. However, the data cited by CNI-UCS (see Tables IIIa, IIIb, IVa, IVb, IVd and VII) clearly demonstrate that the radwaste system modifications introduced in 1971 have been very successful in reducing such effluents. Additional modifications currently being made in connection with off-gas treatment can also be expected to yield reduced I-129 effluent levels. Thus, the past NFS experience has led to advances in reprocessing technology and improvements in environmental and radiological impact reductions and, in this regard, represents an outstanding example of the dynamic nature of the regulatory process. However, without consideration of existing and planned modifications, the past NFS experience does not constitute a valid base upon which to project future performance.

The final objection to the CNI-UCS testimony is the fact that data were often inappropriately applied in computing radiological impacts. In each case maximum release levels, concentration values, etc., have been used as the basis of dose estimates. While we do not object to CNI-UCS postulating a "worst possible case" of radiological impact, the case postulated by CNI-UCS is not a "possible" one, since it is physically impossible to sustain the maximum levels for the entire year, if for no other reason than the batch nature of the process.

The NFS modifications and their significance and the inappropriate use of maxima are further discussed below. As a summary and illustration of the extent to which CNI-UCS has miscalculated the NFS radiological impact, we present Table 5, which should be compared to CNI-UCS Table VIIII (*i.e.*, Table IX). Table 5 sets forth the com-

posite average and maximum human exposure experienced after the introduction in 1971 of the radwaste modifications.

Finally, the CNI-UCS Supplementary Comments suggest proposed revisions to current Commission regulations (*e.g.*, application of human radiological standards to wildlife). While these suggestions patently fall outside the scope of this proceeding, we address them briefly below. Certain additional comments are also set forth below.

System Modifications — As has been alluded to in the CNI-UCS testimony, there has been, in the past, some concern expressed about radionuclides released in liquid effluents. Review of the situation by AEC, NFS and New York State resulted in the decision to augment the liquid waste treatment system. Design efforts were begun on this program in 1968 and the Low Level Liquid Waste Treatment (LLWT) facility became operable in May 1971. The lower 1971 concentration values reported by CNI-UCS (Tables IIIa, IIIb, IVa, IVb, IVd and VII) reflect the good results obtained from operation of this system. Table 5 herein demonstrates the reduced maximum human exposure resulting from such modifications. The assertion by CNI-UCS that this downward trend will "no doubt" reverse itself is based on two misconceptions.

The primary misconception is that processes and treatment systems, once installed, are static in nature. On the contrary, the technological and regulatory framework of the nuclear industry is such that systems and regulations are evolutionary in character. In the case of the LLWT facility, performance is reviewed both by NFS and the AEC and further work is being conducted. In the six-month summary of the LLWT facility (6), NFS indicates that the system was installed because it was "practicable"

to use it for effluent reduction. It further characterizes the system performance, the operational problems encountered, and the actions taken to resolve those problems. In particular, some degradation of resins was observed due to regeneration with nitric acid, and other methods of regeneration (with sulfuric acid, for instance) were being studied. The following table was presented by NFS to characterize system performance.

Average Percent Removal Low Level Liquid Waste Treatment Facility

	June Through Nov. 1971	Sept. Through Nov. 1971
Cs137	87	95
Sr90	80	95.5
Ru-RH106	68	68
Gross B	81	81

A second CNI-UCS misconception is that the reduced effluent levels will increase once higher burnup fuel is reprocessed. To some extent, the NFS plant has been reprocessing higher burnup fuel and the effluent levels nevertheless continue to be reduced as a result of the LLWT facility, since the throughput of higher burnup fuel was considered in the design of the LLWT facility. Moreover, it appears likely that the typical burnup of fuels processed until the end of this decade will be closer to 30,000MWD/MT burnup than to the 40,000MWD/MT figure, primarily because most of the reprocessing load will be from first cores. First cores experience lower burnup by about ⅓ than do equilibrium cores. The consideration by CNI-UCS of 40,000MWD/MT fuel (pp. 3.7, 3.29) is not believed to be representative of facility operation.

It should also be noted that CNI-UCS has not taken into account the operation of the LLWT facility in the discussion (pp. 3.24-3.25) regarding leakage from the NFS burial grounds. While there has been, in the past, some release of radioactive liquids from the burial ground trenches, it is our understanding that these liquids are now routed through the LLWT facility for processing prior to release from the site.

A further plant modification currently being made is the installation of a new gaseous waste treatment system. The most dramatic effect is expected to be in the area of I-129 releases, with greater than 99% removal anticipated. The system has been designed for continuous operation during dissolution, thereby essentially eliminating this source of release to the environment.

Dose Computations — The dose commitment estimate presented by CNI-UCS is misleading because it considers only the case of the individual exposed to the highest concentration that was ever observed for a particular isotope since start of plant operations and whose intake is also a maximum. As pointed out above, the use by CNI-UCS of maximum concentrations is completely unrealistic, because it is physically impossible for NFS to maintain, throughout the year, the maximum discharge levels.

A more realistic dose commitment estimate was made by the Public Health Service in a 1968 study of the NFS radiological conditions (3). That study treated both the average and the maximum human exposure, but the basic analytical approach used in the PHS study was very similar to that of CNI-UCS: the study considered maximum (and average) concentration levels and maximum (and average) intake models and made the conversion from intake to dose commitment. The PHS study discusses the validity of the

model for continuous intake situations, which can be treated as a series of discrete intakes.

Tables 1-4 herein present the PHS data as reported in reference (3). Although the *dose commitment* values reported by CNI-UCS are not supported by a reference, it is assumed that they are based upon the PHS study and that any variations between the CNI-UCS values and the values in the PHS study are due to differences in rounding off. Of more significance, we believe, is the apparent discrepancy between some of the *concentration* values used by each, and the method of choice of some values by CNI-UCS (for example, use of Sr90 concentrations in bottom rather than surface feeders).

As a result of the investigation, the PHS study concluded that the presence of NFS "based on data presently available, did not significantly increase the radiation dose to the 'typical individual' in 1968 above that due to fallout and natural radiation." The PHS did recommend further study in terms of population, size and location, measured intake by man and animals, and additional monitoring of environmental nuclide levels. One part of the recommended study has already been performed. This is the I-129 investigation in milk samples conducted by the New York State Department of Environmental Conservation. A corollary study was performed by the PHS itself (4). As discussed above in the section on System Modifications, as a result of these studies, modifications are being made to the plant which will reduce the level of I-129 releases. As the New York State Department of Environmental Conservation has noted, I-129 has a short field half-life when the releases from the NFS plant are reduced (5).

For purposes of comparison, we present in Table 5 a dose estimate based on 1971 operation as reported by the New

York State Department of Environmental Conservation (6) and using the same assumptions as the Public Health Service (outlined above). It may be observed that there is an appreciable reduction compared to Table 4 in both average and maximum doses from Strontium and Cesium due primarily to the use of the new LLWT facility.

Current Regulations — Existing U. S. regulations for release of radioactive material are based on protection of man from the effects of radiation. Limits are imposed on concentrations in unrestricted areas in which the facility owner is unable to regulate access by members of the public. These are the basic features of the regulations to which UCS is taking exception. Specifically, UCS suggests that release limits be applied in Buttermilk Creek, which is within the restricted area owned by NFS; that human standards be applied to all wildlife found on the NFS property; and that the nonmedical radiation dose values be allocated among various parts of the nuclear industry.

As to the CNI-UCS recommendation that the total permissible population exposure be allocated among sources, we would observe that the AEC is moving in this direction, as exemplified by its proposed Appendix I ("as low as practicable") levels for nuclear power plants. However, since the National Academy of Sciences (NAS) — National Research Council (NRC) Committee has not established or suggested numerical values (2), we believe that the CNI-UCS recommendation of 5-10% of current limits (p. 3.1, p. 3.23) should not merely be mentioned in passing but should have firm substantiation before being considered. It should be noted also that the NFS Technical Specifications provide for a limit on liquid releases of 20% of current AEC regulations on a weekly basis and less than 10% of these levels for a quarter.

The suggestion to apply human radiological standards to wildlife appears unnecessary, since the available data indicates that man is more radiosensitive than other species. Indeed, the NAS-NRC Committee has concluded that "if man as an individual is protected, then other organisms as populations would be most unlikely to suffer harm." (1) The additional admonition by the NAS-NRC Committee that "there should not be attempted the reduction of small risks even further at the cost of large sums of money that spent otherwise, would clearly produce greater benefit" is particularly applicable to these suggested regulatory revisions.

The CNI-UCS recommendation that the radiological releases into Buttermilk Creek be reduced has already been satisfied, to a large extent, by the introduction of the LLWT facility. Further restrictions on releases into Buttermilk Creek appear to us to be unnecessary. The data in Tables IV(a-d) of the Supplementary Comments clearly show that the maximum values of the isotopes measured in Cattaraugus Creek fish are consistently lower than the levels found in Buttermilk Creek fish. This indicates that there is no significant migration of fish from Buttermilk Creek to Cattaraugus Creek. Thus, it appears highly unlikely that the dose received by those fishing in Cattaraugus Creek will be affected by the concentration levels in Buttermilk Creek fish.

Additional Comments — There are a few specific comments which we believe should also be made with regard to the testimony, as follows:

1) p. 3.5 The values cited in Section IV as NFS estimates of annual load in 1975 and 1980 — 125 tons and 2950 tons, respectively — are the total anticipated loads for the total reprocessing industry, not the loads for the NFS facility.

2) p. 3.6 It appears that the 1960 date mentioned in the second paragraph is a typographical error since the facility began operating in 1966.

3) p. 3.9 We believe that liquid discharges are no longer released from lagoon 3 as indicated in the first paragraph but routed through lagoons 4 and 5 before release.

4) p. 3.17 The second column of the table on the bottom of the page should be Pu-239.

5) p. 3.20 The last sentence of the first paragraph should read "32 [not 454] millirems for that year."

6) p. 3.24 CNI-UCS has not presented references or factual bases for several of its statements. Examples of this approach may be found in the phrases on this page — ". . . . contains significant amounts of activity . . ." and "It is estimated that . . ."

7) p. 3.28 The Kr85 limit quoted in the third sentence from the bottom should be $3x10^{-7}$ micro Ci/cc. The value listed is for Kr85m.

8) p. 3.29 The Statement concerning EPA's recommendation of Kr85 recovery systems for nuclear power plants should be documented, if possible. In a recently published report, staff members of EPA's Office of Radiation Programs stated — "Whether it is worthwhile or even desirable to exert further effort to contain the residual krypton-85 is doubtful at the present time." The report further stated that "the potential hazards associated with retaining cylinders of krypton-85 and methods for ultimate storage for about 100 years require further evaluation."(7)

9) pp. 3.30, 3.32 CNI-UCS again uses unquantified terms such as "small," "not inconsequential", "singificant" and "measurable".

10) p. 3.47 It should be noted that the average 1971 value reported for site A045143 (1,425pci/M^3 Kr85) is based on only one measurement at this site. As such, the term "average" appears inappropriate.

References:

(1) "Estimates of Ionizing Radiation Doses in the United States 1960-2000", U. S. EPA-ORP/CSD72-1, August 1972.

(2) "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation", National Academy of Sciences — National Research Council, November 1972.

(3) "An Estimate of Radiation Doses Received by Individuals Living in the Vicinity of a Nuclear Fuel Reprocessing Plant in 1968," U. S. Dept. of Health, Education & Welfare — BRH/NERHL 70-1, May 1970.

(4) "Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant" — U. S. EPA, Office of Radiation Programs, October 1972.

(5) "Radioactivity in Air, Milk and Water for July-September 1972," New York State Department of Environmental Conservation Environmental Radiation Bulletin 72-3, January 1973.

(6) Docket 50201-97, Six Month Summary of Low Level Liquid Waste Treatment Facility," November 1971.

(7) Martin, James E., Galpin, Lloyd L., and Fowler, Ted. W., "Technology Assessment of Risk Reduction Effectiveness of Water Treatment Systems for Light-Water Reactors," Radiation Data & Reports, January 1973 pp. 1-8.

Table 1 — Factors for Calculating Dose Commitments

Radionuclide[a]	Critical organ	Mode	Dose commitment factor[b] (millirem per 50 year per μCi intake)
^{90}Sr (7)	Bone	Ingestion	$8.4 \cdot 10^3$
^{137}Cs (7)	Whole body	Ingestion	$0.06 \cdot 10^3$
^{134}Cs (12)	Whole body	Ingestion	$0.08 \cdot 10^3$
^{60}Co (12)	G.I. tract	Ingestion	$0.04 \cdot 10^3$
^{106}Ru-Rh (12)	G.I. tract	Ingestion	$0.195 \cdot 10^3$
^{3}H (7)	Whole body	Ingestion	0.13
^{3}H (14)	Whole body	Inhalation and skin absorption	[c]$1.87 \cdot 10^6 X_a$
^{85}Kr (14)	Whole body	Submersion in Air	[c]$2.08 \cdot 10^6 X_a$

[a] Reference from which dose model was obtained in parenthesis.

[b] Dose commitment refers to the dose delivered (in millirem) to a critical organ during a 50-year period (or during life) from a particular intake.

[c] X_a (concentration is in terms of μCi/liter) dose is in terms of millirem delivered for the first year after exposure which in this case is analagous to the dose commitment.

(7) SHLEIEN, B. An evaluation of internal radiation exposure based on dose commitments from radionuclides in milk, food, and air. Health Physics 18:267 (1970).

(12) COSWER, K. E., KAYSE, S. V., ROHWER, P. S., SNYDER, W. S. and STRUXNESS, E. G. Dose estimation studies related to proposed construction of an Atlantic-Pacific Interoceanic Canal with nuclear explosives: Phase I, ORNL-4101, Oak Ridge National Laboratories, Oak Ridge, Tennessee (1967).

(14) COWSER, K. E. and TADMOR, J. Krypton-85 and tritium in an expanding world nuclear power economy, in Health Physics Div. annual progress report for period ending July 31, 1968 ORNL-4316, Oak Ridge National Laboratories, Oak Ridge, Tennessee (1968).

Table 2 — A Summary of Yearly Dietary Intakes & Exposure Times

Media	Typical	Maximum
Milk	310 liter	380 liter
Deer	2 kg	50 kg
Fish	5.5 kg	40 kg
Drinking water	440 liter	730 liter
Air	8,736 hours	8,736 hours
River bank	0 hours	200 hours

Table 3 — Concentrations of Radionuclides in Environmental Media Collected Around NFS in 1968 (μCi/liter or μCi/kg)

Radionuclide	Media	Average	Maximum
^{90}Sr	Milk	$11 \cdot 10^{-6}$	$21 \cdot 10^{-5}$
	Deer[a]	$11 \cdot 10^{-5}$	$54 \cdot 10^{-5}$
	Fish[b]	$34 \cdot 10^{-5}$	$64 \cdot 10^{-5}$
^{137}Cs	Milk	$27 \cdot 10^{-6}$	$12 \cdot 10^{-5}$
	Deer	$13 \cdot 10^{-3}$	$67 \cdot 10^{-3}$
	Fish	$63 \cdot 10^{-5}$	$36 \cdot 10^{-4}$
^{134}Cs	Deer	$26 \cdot 10^{-4}$	$12 \cdot 10^{-3}$
^{60}Co	Deer	—	$90 \cdot 10^{-6}$
	Fish	$21 \cdot 10^{-5}$	$30 \cdot 10^{-5}$
^{106}Ru-Rh	Fish	$85 \cdot 10^{-5}$	$21 \cdot 10^{-4}$
^{3}H	Milk	$< 12 \cdot 10^{-4}$	$23 \cdot 10^{-4}$
	Deer	$30 \cdot 10^{-3}$	$46 \cdot 10^{-3}$
	Fish	$12 \cdot 10^{-3}$	$50 \cdot 10^{-3}$
	Drinking water	$< 3 \cdot 10^{-3}$	$10 \cdot 10^{-3}$
	Air[c]	$3 \cdot 10^{-8}$	$8 \cdot 10^{-8}$
^{85}Kr	Air	$23 \cdot 10^{-9}$	[d]$13 \cdot 10^{-8}$

[a] Deer — meat only.

[b] Fish — whole fish.

[c] Survey carried out in 1967.

[d] Survey carried out in 1969.

Table 4 — Dose Commitment Accrued in 1968 in the Vicinity of Nuclear Fuel Service

Radionuclide	Critical organ	Media	Dose commitment[a] (millirem) Typical individual	Maximum individual
^{90}Sr[b]	Bone	Diet[c]	77	90
		Deer	1.9	227
		Fish	16	[d]215
^{137}Cs	Whole body	Diet	1.7	4.5
		Deer	1.6	[e]200
		Fish	0.2	8.6
^{134}Cs	Whole body	Deer	0.4	48
^{60}Co	G.I. tract	Deer	<0.01	0.2
		Fish	0.05	0.5
^{106}Ru-Rh	G.I. tract	Fish	0.9	16.4
^{3}H	Whole body	Diet	<0.1	0.3
		Deer	0.1	0.3
		Fish	<0.01	0.3
		Drinking water	<0.17	1.0
		Air (Inhalation and skin absorption)	<0.05	0.1
^{85}Kr	Whole body	Submersion in air	0.05	0.3

[a] Dose per 50 years or per lifetime.

[b] For ^{90}Sr ∿7 percent of the dose commitment to bone delivered is delivered during the first year after intake:

Diet: 5.4 millirem (typical) and 6.3 millirem (maximum).

Deer: 0.1 millirem (typical) and 16 millirem (maximum).

Fish: 1.1 millirem (typical) and 15 millirem (maximum).

For other radionucldies > 90 percent of the dose delivered in the first year after intake.

[c] Diet intake indirectly determined through use of radionuclide value reported in milk.

[d] Represents whole fish. The majority of ^{90}Sr concentrates in bone which is usually considered inedible. Therefore the dose commitment may represent a high estimate.

[e] From sample caught onsite.

Table 5 — Dose Commitment Accrued in 1971 in the Vicinity of NFS

Radionuclide	Media	Concentration (mCi/l or Mci/kg) Average	Maximum	Dose Commitment (mrem) Average	Maximum
1129	Milk	$0.4x10^{-6}$	$0.9x10^{-6}$	0.9	2.0
Sr90	Diet(1)	$9.4x10^{-6}$	$19x10^{-6}$	66.2	81.9
	Deer(2)	$3.33x10^{-6}$	$10x10^{-6}$	.06	4.2
	Fish(3)	$10x10^{-6}$	$45x10^{-6}$	.46	1.5
Cs137	Diet(1)	$4.6x10^{-6}$	$86x10^{-6}$	.29	3.3
	Deer(2)	$3.94x10^{-4}$	$1.428x10^{-3}$	.05	4.3
	Fish(3)	$4.74x10^{-4}$	$1.666x10^{-3}$	.16	4.0
Cs134	Deer(2)	$69.8x10^{-6}$	$3.14x10^{-4}$	.01	1.3
Co60	Deer(2)	Not Measured	Not Measured	—	—
	Fish(3) (+) only one detectable measurement	—	$23x10^{-6}$	—	.04
Ru-Rh106	Fish(3)	ND	ND	—	—
H3	Diet(1)	ND	$1.170x10^{-3}$	—	.15
	Deer(2)	.232	.684	.06	4.4
	Fish(4)	$33.2x10^{-3}$	$1.8x10^{-1}$	.02	.96
	Water	$33.2x10^{-3}$	$1.8x10^{-1}$	1.9	17.5
	Air (Inhalation)	Not Measured	Not Measured	—	—
Kr85	Air (Submersion)	$65x10^{-9}$	$691x10^{-8}$	.14	1.4

(1) Dietary levels determined from milk measurements — as discussed by the PHS — based on field measurement —
Sr90 intake — milk is 37% of total dietary intake
Cs137 — milk is 30% of total dietary intake
H3 — milk is 40% of total dietary intake

(2) Measured levels in deer muscle.

(3) Measured levels in fish flesh.

(4) Assumed same as in water.

UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

In the Matter of AMENDMENT OF 10 CFR PART 50 — LICENSING OF PRODUCTION AND UTILIZATION FACILITIES (Environmental Effects of the Uranium Fuel Cycle)	Docket No. RM-50-3

NUCLEAR FUEL SERVICES, INC. RESPONSE TO UNION OF CONCERNED SCIENTISTS

Nuclear Fuel Services, Inc. (NFS) welcomes the opportunity to submit a response to the Supplementary Comments by the Union of Concerned Scientists (UCS) on Environmental Survey of the Nuclear Fuel Cycle. Our participation in this proceeding has previously been limited to joining with the Atomic Industrial Forum in the views presented by that organization which we believed pertinent to the matter in issue. We believe the UCS comments add little to the resolution of the questions in issue, but we are compelled to submit a response to UCS since they purport to deal in length with the radiological impact of the NFS fuel reprocessing plant (Plant). The UCS statement is replete with grossly misleading interpretations of data, and proposes findings, conclusions, and recommendations concerning the operations of the Plant grounded on fundamentally erroneous technical and scientific bases.

After UCS so thoroughly criticized the AEC staff for allegedly omitting supporting references and substituting

adjectives for quantification in its "Environmental Survey of the Nuclear Fuel Cycle," it is shocking to note that the UCS statement is guilty of the very same type of omissions. Additionally, the UCS statement lacks any semblance of scientific, objective presentation, and selectively omits data pertaining to matters that it discusses. A sampling of specific deficiencies of the UCS statement are discussed below.

UCS begins with the premise that the confluence of Buttermilk Creek and Cattaraugus Creek is located beyond NFS controlled property (p. 3.4). UCS treats Buttermilk Creek as though all of it is opened to the public for fishing and other activities and calculates potential exposures to radiation on that basis. However, the fact is that the confluence of Buttermilk Creek and Cattaraugus Creek is located entirely within NFS property. Buttermilk Creek is not open to the public for fishing or any other purpose downstream of the Plant. Thus, the UCS calculations of potential exposures based on this erroneous premise are meaningless from a technical and scientific standpoint.

UCS first describes the interceptors and lagoons at the Plant as they existed prior to installation of the Low Level Waste Treatment facility (p. 3.8-3.10). No useful purpose is served by this outmoded description. UCS fails to place this discussion into appropriate context by failing to note that only limited operations were carried on within these initial facilities, that all such operations were carried on in strict compliance with all the applicable regulations, that careful monitoring was performed to assure that the desirability of any improvements would be readily detected and that such improvements were promptly adopted. Thus, UCS obviously sought only to castigate past experience without seeking to include within the record the meaningful improvement achieved on the basis of such experience.

UCS then discusses liquid discharges by the Plant on the basis of data presented in its Table II purportedly summarizing the activity discharged by the Plant from 1966 through 1969 (p. 3.10). Table II is more significant for what has been omitted from it than for what has been included in it. What have been omitted are figures for 1970 and 1971, which figures would show significant decreases in gross beta activity. Apparently, UCS is making an unscientific deliberate attempt to ignore the improvements that have been brought about at the Plant with the installation of the Low Level Waste Treatment facility since data as late as 1972 is contained elsewhere in the UCS statement.

UCS discusses various results of monitoring by the State of New York and presents selected results in its Table III (p. 3.12). Again, Table III is more significant for what has been omitted from it than for what has been included in it. Gross beta activity has been omitted which would have shown absolutely no increasing trend. More significantly, while UCS notes that the State of New York maintains its data in terms of average, minimum, and maximum concentrations, UCS Table III shows only the maximum concentrations. It appears that UCS is unwilling to have its calculations and conclusions based on maximum data placed in context by showing all of the data collected by the State of New York.

UCS in discussing the maximum permissible water concentrations and radioactive contamination of creeks (p. 3.12-3.18) shows a remarkable misunderstanding of the AEC regulations prescribing concentration limits. This misunderstanding is exemplified by UCS' statement that the maximum concentration limits "assume that only a single isotope is present." Apparently, UCS is unaware that the

maximum concentration limits are applicable to all isotopes on a pro rata basis such that

$$\frac{\text{Con} - \text{X}}{\text{MPC-X}} + \frac{\text{Con} - \text{Y}}{\text{MPC-Y}} + \frac{\text{Con} - \text{Z}}{\text{MPC-Z}} = 1.$$

UCS has made a number of comparisons, calculations, and conclusions using maximum data concerning radioactivity concentrations in fish and projecting the potential radiation exposure to a fisherman (p. 3.18-3.22). Since the fisherman cannot select and ingest only those fish with the maximum concentrations it is unreasonable to calculate the resulting radiation exposure from these maximum concentrations. The calculation of dose from ingesting Buttermilk Creek trout is misleading. This stream is not open to the public for fishing and, in addition, it is highly doubtful that the stream contains a 1 kg. trout. The New York Department of Environmental Conservation (NYDEC) has obtained only five to six trout from this stream in all the years of sampling and these specimens have ranged between six and eight inches (0.2 kg. to 0.4 kg.). If modern shocking techniques must be used by NYDEC to obtain these few specimens, it is doubtful that a fisherman would successfully obtain trout in the stream if allowed to fish there. UCS states, "If over the course of the year, such an individual consumed 10 kg. of such fish, the dose commitment would be 454 millirems for that year." This implies that 454 millirems would be received during one year when in actuality it is spread out over fifty years. The yearly exposure if a fisherman would be able to obtain these Buttermilk Creek fish would only be 32 millirems from the 10 kg. of fish. Moreover, the model to estimate radioisotope concentrations in fish by use of reconcentration factors appears to be in error since the model predicts fish concentrations which are a factor of 2 higher than actual fish concentrations determined by analysis. Game fish samples which have been

obtained from Cattaraugus Creek contain low concentrations of radioisotopes and represent the actual exposure path to the fishermen. The resulting exposure from consumption of these fish is very low and well within all applicable limits and guidelines.

UCS has made various calculations concerning the exposure of deer on the Plant premises (p. 3.25-3.26). The calculation of a fifty year dose commitment to a deer appears to be highly questionable since the normal life span of a deer is only approximately three years.

UCS attributes activity observed in the surrounding stream prior to startup of the Plant lagoon system to an "overflow or seepage from the burial grounds" (p. 3.24-3.25). However, that activity was the result of a controlled discharge of rainwater containing trace quantities of radioactivity. This rainwater collected in the trenches during fill operations and was pumped to a holding lagoon for analysis prior to controlled release to the surface stream. Rainwater does not collect and is not transferred from the trenches after they are filled and covered. Morever, rainwater is currently cycled through the Low Level Waste Treatment facility before controlled release to the surface streams. The activity discharged from the burial site is in the millicurie range and does not represent "14% of the cesium in Buttermilk Creek and 20% of the ruthenium" as alleged by UCS.

UCS has presented greatly distorted data concerning krypton-85 (p. 3.28-3.30). The data presented appears to be from measurements taken by the USPHS on 6/14/69; however, the data quoted was measurements on the Plant site and not at the boundary of the property. The average activity was calculated by the USPHS to be 480 pCi/1 for the time period between 11:45 and 14:27. The prorated twenty-four hour concentration would be 54 pCi/1 in contrast to

the 680 pCi/1 average estimated by UCS. The concentration would be considerably less at the site boundary. Based on meteorology data, the maximum annual exposure from krypton-85 would be 11 millirems to the nearest resident at the expanded Plant capacity.

UCS unfairly attributes measured plutonium air concentrations to the operations of our Plant (p. 3.32-3.33). The maximum plutonium concentration observed by NYSDEC was indeed .00043 pCi/m³ of plutonium-239. However, the plutonium-238 concentration for this particular sample was .00005 pCi/m³, not .00014 pCi/m³, as indicated by UCS (.00014 pCi/m³ was the maximum amount of plutonium-238 for the entire sampling program and was from a different sample). The ratio of plutonium-239 to plutonium-238 indicates that the plutonium air concentrations are attributable to fallout rather than the operations of our Plant.

In general, the UCS statement appears designed to create the impression that NFS has continuously ignored the impact of the Plant on the environment and that the planned expansion will greatly multiply the Plant's impact on the environment. Quite to the contrary, the Plant has always been operated well within applicable regulatory limits and from the outset of Plant operations, extensive data has been continuously gathered, analyzed and evaluated to determine where improvements could be made. The planned expansion is only a portion of a total modernization program that was begun in 1969 to improve Plant operations and reduce its impact on the environment. The Low Level Waste Treatment facility was the first step and UCS chose to ignore it by basing its discussion and conclusions almost exclusively on pre-1970 data.

Because of the fundamental irrelevance of the UCS statement to the proceeding, we have chosen not to draw atten-

tion away from the real issues in the proceeding by making detailed corrections to the UCS statement. We have merely attempted to alert the Commission to the unreliability of the UCS statement such that it will not form the basis for any possible erroneous conclusions regarding the NFS Plant's operating history.

Respectfully submitted,

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Dated: April 16, 1973

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UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF	
AMENDMENT OF 10 CFR PART 50 — LICENSING OF PRODUCTION AND UTILIZATION FACILITIES (Environmental Effects of the Uranium Fuel Cycle)	Docket No. RM 50-3

CERTIFICATE OF SERVICE

I hereby certify that I have served copies of the attached document via first class mail, postage prepaid, upon all parties of record.

RONALD D. LEE
Attorney

Dated: April 16, 1973

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WASH-1284

Environmental Survey of the Uranium Fuel Cycle

April 1974

U.S. ATOMIC ENERGY COMMISSION

FUELS and Materials

Directorate of Licensing

PREFACE

In November 1972, the "Environmental Survey of the Nuclear Fuel Cycle" was published by the Fuels and Materials staff of the USAEC Directorate of Licensing. The purpose of this document was to establish a basis for those involved in licensing proceedings to provide informed consideration to the generic question of the environmental effects associated with the uranium fuel cycle in light-water-cooled power reactors.

Comments on the Environmental Survey were solicited in the *Federal Register* notice of a rule-making hearing which was held on February 1 and 2, 1973. The purpose of the hearing was to consider possible amendments to Appendix D of 10 CFR Part 50 to factor the environmental effects of the uranium fuel cycle into the cost-benefit analysis for individual light-water-cooled nuclear power reactors. The present document takes into account the written comments that were submitted in response to the Federal Register notice as well as recommendations for improvement in presentation offered during the hearings.

The Survey and rule-making are both limited to the uranium fuel cycle and the title of this document is being modified accordingly. The off-site environmental effects for each of the fuel cycle operations have been analysed and the data are presented in terms of the annual fuel requirements of a model 1000-MWe nuclear power reactor. Special efforts have been made to be conservative in estimating the nature and quantity of effluents ascribed to the amount of fuel needed for one year's operation of the model reactor. Where operating data were not available, approximations were made which tended to maximize the impact of the fuel cycle on the environment. All effluents, both radioactive and chemical were included. From a review of operations supplying material or utilities to each fuel cycle activity, only the generation of electrical energy for the isotope enrichment step was judged to cause significant environmental effects. The environmental effects of the coal-fired power plants used in the grids supplying the power were therefore included in the survey. These coal fired plants are the major source of gaseous effluents and use the bulk of the water for the entire fuel cycle.

The staff evaluation based upon the original edition of the Environmental Survey indicated that the environmental effects of the uranium fuel cycle that are attributable to the model reactor were small. As a result of the comments and suggestions from interested parties, additional detailed data have been included or referenced in this revised edition of the Environmental Survey. It is important to note that this added material further supports and reinforces the staff's previous conclusions.

Changes that have been incorporated in this updated edition include the following:

1. The Waste Management Section has been enlarged and expanded to include the material presented in

the testimony given during the hearings by Dr. F. K. Pittman, Director of the AEC's Division of Waste Management. Data on the proposed near term Retrievable Surface Storage Facility (RSSF) for above-grade storage of solidified high-level waste have been incorporated. Included is a reference preliminary design for the RSSF, based on existing technology, to demonstrate the validity of this concept. A brief discussion of the design with specific data relating to environmental effects, safety and accident analysis has been included.

2. The subject of "Contributions to the General Exposure" has been addressed in further detail in each basic step of the uranium fuel cycle and this separate category of analysis has been included.

   Previously, the potential exposure to the general public from minute quantities of radionuclides was considered for each step of the uranium fuel cycle. Investigation of this effect has been amplified in the present edition to include consideration of mechanisms or possible terrestrial concentrations of nuclides from the fuel cycle.

3. The reprocessing chapter has been expanded by including data and evaluations from environmental studies of the off-site environs of the Savannah River Plant and the Hanford facilities. This material has been included to provide information about the effects of the only long-term operations of fuel reprocessing plants. Data on the only commercially operated fuel reprocessing plant at West Valley, New York also have been summarized in this section to include data on this commercial plant. This report was published after the November 1972 Environmental Survey.

Neither the previous document, "Environmental Survey of the Nuclear Fuel Cycle", nor the present document, "Environmental Survey of the Uranium Fuel Cycle", is intended to be a detailed environmental statement as defined in the National Environmental Policy Act of 1969 and Appendix D of 10 CFR 50 of the AEC's regulations. With the exception of the government-owned isotope enrichment plants and a few uranium mills in states having regulatory authority over such mills, all facilities considered in both documents have been the subject of detailed safety reviews by the staff and are operating under licenses issued by the AEC; they received individual environmental reviews under the AEC's regular policies and procedures governing such facilities. The information contained within both documents has been obtained from government and industry sources, and in some cases, from consultants. A detailed list of references, from which this information was obtained, is given at the end of each section of the survey.

The staff is grateful for the careful consideration given by all reviewers and users to the content of the Survey. Their contributions in the form of suggested improvements and detection of errors have helped to strengthen this document which serves as the technical basis for this important rulemaking decision.

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SUMMARY

1. *Background and Purpose*

As part of the Federal licensing actions for individual nuclear power plants, detailed environmental statements are issued as public documents in conformance with the National Environmental Policy Act (NEPA) of 1969. These statements assess the environmental impact associated with the construction and operation of the specific nuclear power plant, as well as the transportation of radioactive materials to and from the plant. This document is an environmental survey of the nuclear fuel cycle which supports the individual nuclear power plants.

Detailed environmental reviews are carried out in the separate licensing actions for each individual fuel cycle facility involved in the handling of source material, or special nuclear material, and for production facilities. Most of the facilities discussed in this environmental survey were constructed and licensed by the AEC prior to the enactment of NEPA. Accordingly detailed assessments of environmental impact have not been carried out on facilities that predated the NEPA act. It is expected, however, that detailed environmental reviews on the fuel cycle facilities processing the bulk of the nation's fuel material will be accomplished within the next few years as a result of planned modifications and expansions of existing plants, and construction of new ones. This environmental survey is not intended in any way to replace or preclude these thorough and meticulous analyses of individual plants.

2. *Scope*

This survey assesses the environmental considerations related to the currently predominant uranium fuel cycle

for uranium dioxide (UO_2) fueled, light-water moderated and cooled nuclear power plants (LWR). In the United States, about 99% of the electric power generated from nuclear fuel incorporates this fuel cycle and a large percentage of the plants that are under consideration for construction permits or operating licenses will utilize this fuel cycle. In addition, estimates of the nuclear generation of electric power indicate that this predominance of LWR use will prevail through most of the present decade. Alternative nuclear fuel cycles involving the fuel cycle for gas-cooled reactors, plutonium recycle in the present generation of LWR power reactors, and the fast breeder cycle will be considered in future documents.

The specific components comprising the LWR supporting fuel cycle are shown in Figure S-1 and include the following:

(a) Mining uranium ore.

(b) Milling and refining ore to produce uranium concentrates (U_3O_8).

(c) Production of uranium hexafluoride (UF_6) from uranium concentrates to provide feed for isotopic enrichment.

(d) Isotopic enrichment of uranium hexafluoride to attain reactor enrichment requirements using the gaseous diffusion process.

(e) Fabrication of nuclear reactor fuel including: converting UF_6 to uranium dioxide (UO_2), pelletizing, encapsulating in rods and assembling fuel elements.

(f) Reprocessing irradiated fuel and converting uranium to UF_6 for recycle through the gaseous diffusion plant for re-enrichment.

(g) Radioactive waste management of high level and other than high level wastes, including long-term storage of wastes.

(h) Transportation activities associated with moving materials to and from each of the above operations.

As discussed earlier, the environmental considerations relating to the construction and operation of the individual nuclear power plants, including transportation of radioactive materials to and from the power plant, are considered in detailed environmental statements in the separate licensing actions for each individual facility.

The manufacturing operations supporting the nuclear fuel cycle have been reviewed and those that have been judged to be relatively remote, indirect, and less significant contributors to the environmental impact of the nuclear fuel cycle have not been included in this statement. Typical operations in this category include production of commercial reagents such as sulfuric acid, hydrogen fluoride, ammonia, nitric acid, etc.

In many instances improvements in technology are available and plans are underway for incorporating these advances into production facilities. However, the primary basis of the present survey is today's industry with only minimal allowances for advances that may be accomplished in the future. In line with Commission practice, standards and criteria relating to fuel cycle facilities are continually evaluated and modified as appropriate to reflect experience, changing technology, and expansion of the industry. Thus, future environmental evaluation should also reflect continuing changes and advances as they affect the current mode and level of operations.

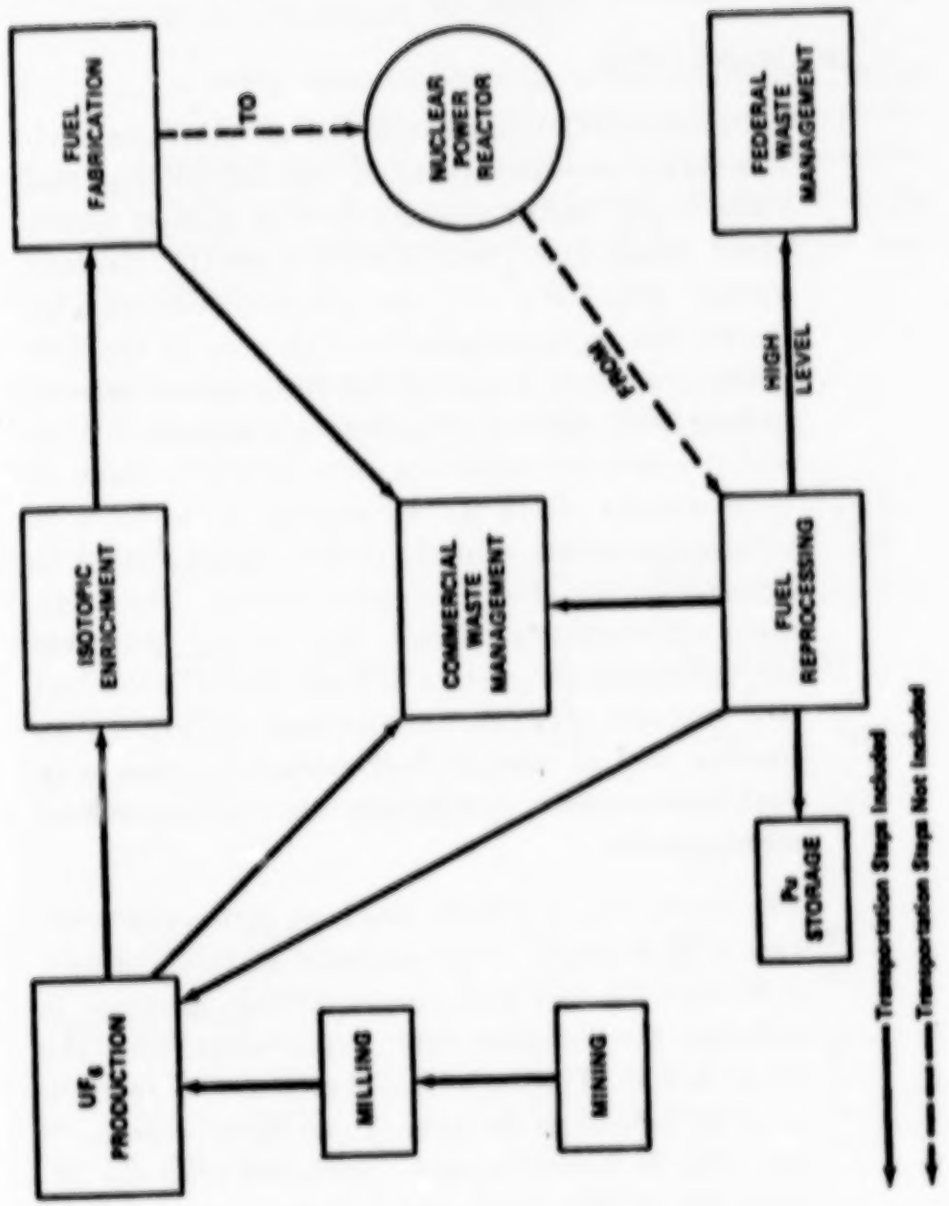

Figure S-1
URANIUM FUEL CYCLE – LIGHT WATER REACTORS
NO PLUTONIUM RECYCLE

3. *Nuclear Industry Models*

(a) Model LWR

A "model LWR" was developed to relate the environmental considerations of the supporting fuel cycle to the annual operation of a nuclear power plant using data from WASH-1139(71), Nuclear Power 1972-7000. In the development of this model, the requirements for each step of the fuel cycle have been reviewed for the current generation of 1000 MWe boiling water reactors (BWR) and pressurized water reactors (PWR). Both of these classes of LWR's utilize fuel in the form of sintered uranium dioxide pellets encapsulated in either stainless steel or zircaloy tubing. The maximum requirements in each step of the fuel cycle used to define the model LWR are listed in the first two columns of Table S-1 for both an initial core loading and an annual fuel reload together with fuel performance parameters used to define fuel requirements.

The useful life of LWR's has been estimated at between 30-40 years. For purposes of this analysis, a 30-year life has been conservatively assumed in defining the "annual fuel requirement" for the model LWR. The model LWR annual fuel requirement is defined as the sum of one initial core loading plus 29 annual reloads, averaged over the 30-year life of the plant, and is listed for each step of the fuel cycle in the third column of Table S-1. In discussing the environmental considerations of the nuclear fuel cycle steps in subsequent sections, resource use and effluent quantities have been related to this annual fuel requirement.

(b) Model Fuel Cycle Facilities

In some steps of the fuel cycle, numerous plants utilizing a wide variety of alternative processes and operations are involved. To evaluate environmental effects on a generic basis, a model fuel cycle facility for each component of the fuel cycle was defined.

TABLE S-1
CHARACTERISTICS OF MODEL LWR (1000 MWe)
MAXIMUM FUEL CYCLE REQUIREMENTS

	Initial Core	Annual Reload	Lifetime Average Annual Fuel Requirement
Irradiation level (MWD_t/MTU) x 10^{-3}	24	33	33
Fresh fuel assay (wt% U-235)	2.6	3.2	3.2
Spent fuel assay (wt% U-235)	0.76	0.84	0.84
Ore supply (MT) x 10^{-3}	332	82.5	91
Yellowcake U_3O_8 supply (MT)	665	165	182
Natural UF_6 (MT)	840	250	270
Separative work (MT SWU)	304	110	116
Enriched UF_6 (MT)	200	47	52
Enriched UO_2 (MT)	152	36	40
Fuel loading (MTU)	134	32	35

Bases
Reactor plant load factor — 80%
Enrichment tails assay — 0.25%
No plutonium recycle
Reloads include recovered uranium
Losses of 1% each in fuel fabrication and reprocessing

MT = metric ton = 2205 lbs.
MTU = metric ton uranium
MT SWU = separative work units in metric tons

Where industry has used one predominant method or one type of facility, that method or facility has been defined as the model facility. Where a single predominant operation has not been used, the mode of operation that imposes the most significant impact on the environment has been selected as the model. In some cases, where the nature of the impact from two or more modes of operation differs significantly, the aggregate operation of all plants, normalized to an appropriate annual capacity, has been selected as the model fuel cycle facility. The model fuel cycle facilities are not intended to represent particular plants. However, the models were selected to be representative of the industry and to lead to conservative or pessimistic assessments of the environmental considerations.

In the case of mining, milling, fuel fabrication, and radioactive waste management, the above approach resulted in the adoption of representative individual facilities as the model facilities. The UF_6 production model is a composite of the total industry complex of two plants that are presently in operation. The isotopic enrichment model is the total government-owned, contractor-operated complex of three plants essentially as it exists today. The reprocessing model is a composite of the total industry complex of three plants as they are planned for operation in the middle of this decade. Table S-2 gives the annual capacity of each model fuel cycle facility and relates this capacity to the annual fuel requirement of the model LWR.

The lifetime of each model fuel cycle facility was estimated to relate the land use to the model LWR

annual fuel requirement. These estimates are generally 20 years which are on the low side of the expected lifetimes, so that the resulting land use numbers are conservative.

4. *Approach to the Assessment of Environmental Considerations*

In this broad survey of environmental considerations, the nuclear fuel cycle is treated on a generic basis. This approach permits an overview of the entire industry without keying the study to particular plants and manufacturers. In order to compensate for the lack of specific detail, effluent concentrations, radiation dose rates, and human population densities appropriate to the model fuel cycle facilities are estimated in each section.

Whenever possible, the environmental considerations have been related to the annual operation of a model LWR. This has been accomplished by normalizing the land use, water use, fossil fuel use, and effluent releases (including chemical, radiological, and thermal) to the model LWR annual fuel requirement, defined above in part 3.a of this section. The summary tables in each section, and the main summary table in this section, present the environmental considerations on this normalized basis.

TABLE S-2
NUCLEAR FUEL CYCLE
CAPACITIES RELATIVE TO THE
ANNUAL FUEL REQUIREMENTS OF A MODEL LWR

	Fuel Cycle Plant Annual Capacity		Equivalent Number of Model LWR Annual Fuel Requirements
	Range	Model	
Uranium Mine (MT ore) x 10^{-3}	250–750	480	5.3
Uranium Mill (MT U_3O_8)	500–1100**	960	5.3
UF_6 Production (MTU)	5000–10,000	5000	27.5
Isotopic Enrichment (MT SWU)	6000–17,000	10,500*	90
UO_2 Fuel Fabrication (MTU)	300–1000	900	26
Spent Fuel Reprocessing (MTU)	300–1500	900	26

*Current operating level of industry and assumed model plant capacity
**Characteristic of about 70% of current facilities

It is recognized that the considerations presented in the summary tables may not adequately express the actual environmental impact of the fuel cycle. Accordingly, this information has been supplemented with concentrations and dose rates and compared with applicable and available standards.* These additional considerations are presented in the summary text in each section, as well as in the summary text in part 5 of this Section. Whereas the information presented in the summary table is normalized to the annual operation of a model LWR, it is unrealistic to express concentrations, dose rates, and postulated accident effects on this basis. Accordingly, these considerations are based upon the operation of the model fuel cycle facilities at the design throughput (from Table S-2).

*Most commonly used Federal, State and international standards were utilized for both radiological and non-radiological effluents.

A detailed environmental review of an industrial process effluents involves the consideration of three components. These are (1) a source term or rate of effluent release, (2) a dilution term, or dispersion of the effluent throughout the medium under consideration, and (3) a population term, giving the distribution of human beings or biota affected by the effluent. To evaluate environmental impact, these factors must be combined.

Estimates of effluent concentrations and radiation doses at the site boundaries of the model fuel cycle facilities are based upon experimental data or calculated values. Where measurements are available, these data have been used. In most cases, however, it has been necessary to calculate these quantities, based upon estimated release rates and a model for dispersion. For the fuel reprocessing step, detailed analyses have been made of atmospheric dispersion in conjunction with the NEPA review and the preparation of the detailed environmental statement for specific plants. Therefore for that step in the nuclear fuel cycle the discussion is based upon actual meteorological conditions at the specific sites. For other components of the fuel cycle, for which no such data were available, the model utilizes x/Q values which are 1/10 of those given in AEC Safety Guide No. 3, as applicable for the model sites.

Where measured or estimated concentrations of chemicals in surface waters were available, these concentrations have been compared with the recommended criteria contained in the Water Quality Criteria "Green Book."** This volume represents the most comprehensive document on water quality requirements, and is used as a basic reference by agencies engaged in water quality standards setting activities. The recommended

**Water Quality Criteria; Report of the National Technical Advisory Committee to the Secretary of the Interior; U. S. Federal Water Pollution Control Administration; Washington, D. C., April 1, 1968.

criteria are for surface water which is to be subjected to normal water supply treatment prior to consumption as drinking water.

Airborne effluent concentrations have been compared with current EPA National Secondary Ambient Air Quality Standards,* where these are available. The secondary standards are designed to protect the public welfare from any known or anticipated adverse effects associated with the presence of air pollutants in the ambient air. For sulfur oxides, the secondary standard is 0.02 ppm, annual arithmetic mean, and for nitrogen dioxide it is 0.05 ppm annual arithmetic mean.

It is important to note that the discussion of environmental considerations in this document is confined to off-site effects; occupational health and safety of on-site workers are given major consideration by the AEC in detailed safety licensing reviews for individual facilities.

5. *Summary of Environmental Considerations*

The principal environmental considerations for each component of the nuclear fuel cycle, and the aggregate considerations, normalized to the annual fuel requirement of a 1000 MWe model LWR, are summarized for the nuclear fuel cycle in Table S-3. Table S-3A similarly summarizes the consideration for each step in the nuclear fuel cycle.

In the document, land commitments are described as "temporary" or "permanent." A "temporary" land commitment is a commitment for the life of the plant, or succeeding plants. On the abandonment or decommissioning of the plant, such committed land can be

*National Primary and Secondary Ambient Air Quality Standards, published by the Environmental Protection Agency, Federal Register, Volume 36, Number 84, April 30, 1971.

TABLE S-3

Summary of Environmental Considerations for Uranium Fuel Cycle

(Normalized to Model LWR Annual Fuel Requirement)

	Total	Maximum Effect per Annual Fuel Requirement of Model 1000 MWe LWR
Natural Resource Use		
Land (acres)		
Temporarily committed	63	
Undisturbed area	45	
Disturbed area	18	Equivalent to 90 MWe coal-fired power plant
Permanently committed	4.6	
Overburden moved (millions of MT)	2.7	Equivalent to 90 MWe coal-fired power plant
Water (millions of gallons)		
Discharged to air	156	~2% model 1000 MWe LWR with cooling tower
Discharged to water bodies	11,040	
Discharged to ground	123	
Total	11,319	<4% of model 1000 MWe LWR with once-through cooling
Fossil Fuel		
Electrical energy (thousands of MW-hr.)	317	<5% of model 1000 MWe LWR output
Equivalent coal (thousands of MT)	115	Equivalent to the consumption of a 45 MWe coal-fired power plant
Natural gas (millions of scf)	92	<0.2% of model 1000 MWe energy output
Effluents — Chemical (MT)		
[1]Gases (including entrainment)		
SO_x	4,400	
[2]NO_x	1,177	Equivalent to emissions from 45 MWe coal-fired plant for a year.
Hydrocarbons	13.9	

[1]Estimated effluents based upon combustion of equivalent coal for power generation.

[2]1.2% from natural gas use and process.

TABLE S-3 (Cont.)

Summary of Environmental Considerations for Uranium Fuel Cycle
(Normalized to Model LWR Annual Fuel Requirement)

	Total	Maximum Effect per Annual Fuel Requirement of Model 1000 MWe LWR
Effluents — Chemical (MT) (Cont.)		
CO	28.7	
Particulates	1,156	
Other Gases		
F^-	0.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards — below level that has effects on human health.
Liquids		From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constituents that require dilution and the flow of dilution water are: NH_3 — 600 cfs; NO_3 — 20 cfs; fluoride — 70 cfs
$SO_4^=$	10.3	
NO_3^-	26.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl^-	8.6	
Na	16.9	
NH_3	11.5	
Fe	0.4	
Tailings Solutions (thousands of MT)	240	From mills only — no significant effluents to environment.
Solids	91,000	Principally from mills — no significant effluents to environment.
Effluents — Radiological (curies)		
Gases (including entrainment)		
Rn-222	75	Principally from mills — Maximum annual dose rate <4% of average natural background within 5 miles of mill. Results in 0.06 man-rem per annual fuel requirement.
Ra-226	0.02	
Th-230	0.02	
Uranium	.032	

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TABLE S-3 (Cont.)

Summary of Environmental Considerations for Uranium Fuel Cycle
(Normalized to Model LWR Annual Fuel Requirement)

	Total	Maximum Effect per Annual Fuel Requirement of Model 1000 MWe LWR
Effluents — Radiological (curies) (Cont.)		
Tritium (thousand)	16.7	Principally from fuel reprocessing plants — Whole body dose is 4.4 man-rem per annual fuel requirements for population within 50-mile radius. This is <0.005% of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/yr has been included in fission products and transuranics total.
Kr-85 (thousands)	350	
I-129	0.0024	
I-131	0.024	
Fission Products & Transuranics	1.01	
Liquids		
Uranium & daughters	2.1	Principally from milling — included in tailings liquor and returned to ground — no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production-concentration 5% of 10 CFR 20 for total processing of 27.5[6] model LWR annual fuel requirements.
Th-230	.0015	
Th-234	0.01	From fuel fabrication plants — concentration 10% of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Ru-106	0.15*	From reprocessing plants — maximum concentration 4% of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (thousands)	2.5	
Solids (buried)		
Other than high level	601	All except 1 Ci comes from mills — included in tailings returned to ground — no significant effluent to the environment, 1 Ci from conversion and fuel fabrication is buried.
Thermal (billions)	3,360	<7% of model 1000 MWe LWR.
Transportation (man-rem)		
Exposure of workers and general public	0.334	

*Cs-137 (.075 Ci/AFR) and Sr-90 (.004 Ci/AFR) are also emitted.

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TABLE S-3A

Summary of Environmental Considerations for Nuclear Fuel Cycle

Normalized to Model LWR Annual Fuel Requirement

Natural Resource Use	A Mining	B Milling	C UF_6 Prod.	D Enrichment	E Fuel Fab.	F Reprocessing	G Waste Management	H Transportation	Total
Land (Acres)									
Temporarily Committed	55	0.5	2.5	0.8	0.2	3.9	—	—	63
Undisturbed Area	38	0.2	2.3	0.6	0.16	3.7	—	—	45
Disturbed Area	17	0.3	0.2	0.2	0.04	0.2	—	—	18
Permanently Committed	2	2.4	0.02	0.0	0.0	0.03	0.2	—	4.6
Overburden moved (millions of MT)	2.7	—	—	—	—	—	—	—	2.7
Water (millions of gal.)									
Discharged to air	—	65	3.3	84	—	4.0	0.13	—	156
Discharged to water bodies	—	—	23.0	11,006	5.2	6.0	0.13	—	11,040
Discharged to ground	123	—	—	—	—	—	—	—	123
Total Water	123	65	26.3	11,090	5.2	10.0	0.26	—	11,319
Fossil Fuel									
Electrical energy (thousand MW-hr.)	0.25	2.70	1.70	310	1.7	0.45	.0077	—	317
Equivalent Coal (thousand MT)	0.09	0.97	0.62	113	0.62	0.16	.003	—	115
Natural Gas (million scf)	—	68.5	20.0	—	3.6	—	—	—	92

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TABLE S-3A (Cont.)

Summary of Environmental Considerations for Nuclear Fuel Cycle

Normalized to Model LWR Annual Fuel Requirement

Natural Resource Use	A Mining	B Milling	C UF_6 Prod.	D Enrichment	E Fuel Fab.	F Reprocessing	G Waste Management	H Transportation	Total
Effluents									
Chemical (MT)									
Gases (MT)									
SO_x	8.5	37.0	29.0	4,300	23	6.2	—	—	4,400
NO_x	5.0	15.9	10.0(3)	1,130	6	7.1(4)	—	2.6	1,177
Hydrocarbons	0.3	1.3	0.8(2)	11	0.06	0.02	—	—	13.5
CO	0.02	0.3	0.2	28	0.15	0.04	—	—	28.7
Particulates	—	9.7	7.6	1,130	6	1.6	—	—	1,156
Other Gases									
F−	—	—	0.11	0.5	0.005	0.11	—	—	0.72
Liquids									
$SO_4=$	—	—	4.5	5.4	—	0.4	—	—	10.3
NO_3	—	—	0.1	2.7	23	0.9	—	—	26.7
Fluoride	—	—	8.8	—	4.1	—	—	—	12.9
Ca−	—	—	—	5.4	—	—	—	—	5.4
Cl+	—	—	0.2	8.2	—	0.2	—	—	8.6
Na	—	—	3.9(5)	8.2	—	5.3	—	—	16.9
NH_3	—	—	—	—	10.0	—	—	—	11.5
Tailings Solutions (thousands)	—	240	1.5	—	—	—	—	—	240
Fe	—	—	—	0.4	—	—	—	—	0.4
Solids	—	91,000	40	—	26	—	—	—	91,000

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(1) Estimated Effluents Based Upon Combustion of Equivalent Coal for Power Generation
(2) Combined Effluents from Combustion of Coal and Natural Gas and process tankage; contains 0.2 MT of Hexane
(3) 25% from natural gas use
(4) 77% from process
(5) Contains about 80% Potassium

TABLE S-3A (Cont.)

Summary of Environmental Considerations for Nuclear Fuel Cycle

Normalized to Model LWR Annual Fuel Requirement

Natural Resource Use	A Mining	B Milling	C UF_6 Prod.	D Enrich-ment	E Fuel Fab.	F Repro-cessing	G Waste Manage-ment	H Transpor-tation	Total
Effluents (cont.)									
Radiological (curies)									
Gases (including entrainment)	—	74.5	—	—	—	—	—	—	74.5
Rn-222	—	0.02	—	—	—	—	—	—	0.02
Ra-226	—	0.02	—	—	—	—	—	—	0.02
Th-230	—	0.03	0.0015	0.002	0.0002	—	—	—	0.032
Uranium	—	—	—	—	—	16.7	—	—	16.7
Tritium (thousands)	—	—	—	—	—	350	—	—	350
Kr-85 (thousands)	—	—	—	—	—	0.0024	—	—	0.0024
I-129	—	—	—	—	—	0.024	—	—	0.024
I-131	—	—	—	—	—	1.0	—	—	1.0
Fission Products	—	—	—	—	—	0.004	—	—	0.004
Transuranics	—	—	—	—	—	—	—	—	—
Liquids	—	2	0.044	0.02	0.02	—	—	—	2.1
Uranium & Daughters	—	—	0.0034	—	—	—	—	—	0.0034
Ra-226	—	—	0.0015	—	—	—	—	—	0.0015
Th-230	—	—	—	—	0.01	—	—	—	0.01
Th-234	—	—	—	—	—	2.5	—	—	2.5
Tritium (thousands)	—	—	—	—	—	0.15	—	—	0.15*
Ru-106	—	—	—	—	—	—	—	—	—
Solids (buried)	—	600	0.86	—	0.23	—	—	—	601
Other than high level	—	69	20	3200	9	61	1.0	0.03	3,360
Thermal (billions of Btu)									

*Cs-137 (0-075 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

used for any purpose. "Permanent" commitments of land represent land that may not be released for use after plant shutdown and decommissioning.

(a) Use of Natural Resources

(1) Land

The temporary land commitment amounts to 63 acres per annual fuel requirement for the model LWR. More than 70% of this land is an undisturbed area or which may be withdrawn by fencing from active use by human habitation. The fencing also restricts migration of large animals. Approximately 18 acres are transformed from their original state by the construction of facilities. Less than 5 acres of land are permanently committed to the production of the annual fuel requirement for a model LWR.

At any time, the total temporary land commitment required by the fuel cycle to support a 1000 MWe LWR is about 750 acres. The total permanent land commitment, assuming a 30-year reactor life, is about 140 acres.

To cast the land requirements into further perspective, a coal-fired power plant of 1000 MWe capacity requires the disturbance of approximately 200 acres per year for strip mining alone. The disturbed area for the nuclear fuel cycle amounts to approximately 18 acres per annual fuel requirement of a model LWR, which is less than 10% of the equivalent annual coal mining land commitment or equivalent to a 90 MWe coal-fired power plant fuel requirement.

(2) Water

Water is used in the nuclear fuel cycle both as a coolant and for process requirements. Water uses have been grouped into three categories based upon the method of return of the water to the biosphere. Water is evaporated into the air, discharged into water bodies or is returned to the ground.

The largest quantity of water involved is the 11 billion gallons required to remove the waste heat from the power stations supplying electrical energy to the enrichment step of the nuclear fuel cycle in the production of an annual fuel requirement. Assuming once-through cooling at these power stations, all of this water is returned to surface water bodies. An additional 319 million gallons of water are directly involved at the fuel cycle plants for cooling, process, and dewatering requirements, totaling 11.3 billion gallons of water moved in producing the annual fuel requirement for the model LWR.

In order to remove the waste heat from a 1000 MWe nuclear power plant on a once-through basis, approximately 300-400 billion gallons of water are pumped annually. Thus, the total demand for water in the components of the nuclear fuel cycle constitutes less than 4% of the water requirement of a 1000 MWe LWR.

The largest single direct dissipation of water by evaporation in the nuclear fuel cycle is for process cooling in the enrichment step. The

gaseous diffusion plants evaporate approximately 84 million gallons of water to the atmosphere per model LWR annual fuel requirement. This constitutes approximately 54% of the 156 million gallons of water discharged to the atmosphere in the nuclear fuel cycle. As a point of reference, a 1000 MWe LWR utilizing cooling towers would evaporate approximately 7 billion gallons of water per year to the atmosphere or more than 40 times the evaporative use of water by the nuclear fuel cycle to produce the fuel for a year's operation.

The requirement for uranium mine drainage moves over 120 million gallons of water per model LWR annual fuel requirement. However, minimum depletion is involved, since the water is pumped from the bottom of the mine pit to the ground surface for return to ground water at some other location with some being returned to the atmosphere by evaporation.

(3) Other

The uranium enrichment component of the nuclear fuel cycle requires over 98% of the electrical energy required by the fuel cycle. The total electrical requirements are 317 thousand MW-hr for the annual fuel requirement of a model LWR. A 1000 MWe LWR would produce 7 million MW-hr in annual operation at a load factor of 80%. Thus the electrical requirements of the nuclear fuel cycle to produce fuel for this reactor are less than 5% of the energy produced by the reactor in a year's operation.

At present most of the electricity generated in the United States is produced in plants that burn fossil fuels. Assuming that coal comprises the bulk of fossil fuel utilization, the electrical energy requirements of the fuel cycle correspond to the consumption of 115 thousand MT of coal. A 1000 MWe coal-fired station consumes approximately 2540 thousand MT of coal annually. Thus, the nuclear fuel cycle for a model 1000 MWe LWR consumes about the quantity of coal required for a 45 MWe fossil-fueled plant.

Additionally, approximately 90 million scf of natural gas are consumed for process heat, most of which is used in the milling operation. This quantity of natural gas could be used to generate roughly 9,000 MW-hr of electricity, which is less than 0.2% of annual output of the model LWR.

(b) Effluents

(1) Chemical

(i) Gaseous

At present, most of the power plants that supply electricity to the fuel cycle operations burn coal. Consequently, the combustion products of coal comprise nearly all of the airborne chemical effluents attributable to the fuel cycle and approximate the effects from the operation of a 45 MWe coal-fired power plant for a year. The main contributor to these gaseous effluents is the uranium enrichment step,

which consumes over 98% of the electrical energy required by the fuel cycle. The existing plants draw power from the grids of large utilities; thus, no single power supply source can be identified with the gaseous effluents. To the extent that power is supplied by nuclear power plants, the total quantity of sulfur dioxide, nitrogen oxides, hydrocarbons, carbon monoxide, and airborne particulates would be greatly reduced.

Fluorine is introduced into the fuel cycle during the UF_6 production step and is removed from the fuel material in the fuel fabrication step. As a result, fluorine becomes an airborne effluent from several steps of the nuclear fuel cycle. Although most of the fluorine gaseous wastes are effectively removed by scrubber treatment systems, approximately 0.7 MT per model LWR annual fuel requirement is released to the environment as an airborne contaminant. To put this quantity into perspective, the estimated fluoride emissions from four major industries are given in Table S-4. Assuming a nuclear power generation industry of 140 model LWR's by 1980, approximately 100 MT of gaseous fluorides would be released annually by the entire nuclear industry at that time. This constitutes about 0.1% of the total annual quantity of fluoride emissions from the total of the industries noted in Table S-4.

Despite the trivial nature of this effluent in comparison with other major industries, the airborne fluoride release from the nuclear fuel cycle could constitute a potential for adverse environmental impact. Measurements or calculations of airborne fluoride concentrations at the site boundaries of specific plants fall within the range of 0.005-2.0 $\mu g/m^3$. For

TABLE S-4

ESTIMATED FLUORIDE EMISSIONS FROM MAJOR U. S. INDUSTRIES

Source	Emissions MT/yr.
Phosphate Industry (principally fertilizer manufacture)	17,000
Aluminum Manufacture	15,000
Steel Manufacture	39,000
Brick, tile, glass manufacture	19,000
TOTAL	90,000

perspective, these concentrations are well below the level of observed adverse effects on human health, and they span the range of existing state standards.* State standards are used for comparison because there are no applicable Federal Standards.

At uranium mills and UF_6 production plant sites, the combustion of natural gas

*State of Washington: 0.5 $\mu g/m^3$
State of Pennsylvania: 5.0 $\mu g/m^3$

for process heat is a source of nitrogen oxide release to the environment. Dispersion calculations indicate that annual mean NO_x concentrations are within the EPA air quality standards of 100 $\mu g/m^3$. That standard, according to the Environmental Protection Agency, is adequate to protect the public welfare from any known or anticipated adverse effects associated with the presence of oxides of nitrogen in ambient air.

(ii) Liquid

The largest quantity of liquid effluents, 240 thousand of waste solutions per annual fuel requirement, contains sulfuric acid and other spent chemicals from the milling processes. This waste liquor, however, is discharged to the tailings pond, and since it does not normally contaminate unrestricted ground or surface bodies of water, it does not actually become an effluent stream.

Significant quantities of a number of chemicals are discharged in liquid effluents from the UF_6 conversion, enrichment, fuel fabrication and reprocessing steps. The UF_6 conversion plant releases sulfates, fluorides, chlorides, sodium and potassium, ammonia, and iron in its liquid waste. After mixing in the adjacent river, the calculated increase in river water impurities does not exceed 4% under average conditions at the dry process plant. Meas-

ured concentrations of fluoride and nitrate downstream of the wet process plant show these concentration to be below surface water standards.

The concentrations of fluorides, nitrates, and ammonia contained in the liquid waste streams from the model fuel fabrication plant are a possible source of adverse environmental effect. Dilution of these constituents by the receiving body of water by 1-3 orders of magnitude may be required to achieve drinking water source quality, depending upon the flow rate of the receiving body of water, its upstream quality and its downstream use. Efforts are in progress to minimize these releases from existing plants.

The liquid effluent quantities from enrichment appear large but generally the chemicals do not constitute a potential for adverse environmental effect and are present at or near drinking water concentrations. The enrichment step contributes the largest total quantity of liquid contaminants, but the concentrations of potential contaminants in the effluent streams are generally within the range of permissible standards.* Additional dilution by about 700-1000 times by the receiving body of water decreases the concentrations well below acceptable levels.

Treatment facilities are being planned to reduce the release of hexavalent chro-

*Water Quality Criteria, U. S. Department of the Interior, April 1, 1968.

mium. The iron concentration, another restrictive species, is diluted to approximately 0.003 ppm in the receiving bodies of water, two orders of magnitude below the recommended criteria.

Fluoride and nitrate wastes are contained in the liquid effluents from UF_6 production plants, while nitrates, sodium, chloride, and sulfates are the principal contaminants in liquid effluents from fuel reprocessing operations. In both cases, dilution in receiving rivers is adequate to reduce the incremental increase in concentration of these species to fractions of a ppm, and at least an order of magnitude below Water Quality Criteria, U. S. Department of the Interior, April 1, 1968.

(iii) Solid

The greatest bulk of solid materials is generated in the open pit mining and milling operations. The barren rock and earth overburden produced by the mine temporarily constitute a waste material, but are essentially returned to the barren mine as backfill and have not been considered as an effluent. The tailings from the mill are composed primarily of sandstone and clays and constitute the major quantity (91,000 MT) of solid waste from the fuel cycle. They are pumped as a slurry to the tailings pond, where they are permanently stored as solids in a chemical form similar to their original

condition, but containing slightly less radioactivity, since uranium has been removed.

The 50 tons of ash generated by the hydrofluor UF_6 production process consists of nonvolatile fluorides. Since the ash residue contains traces of radionuclides, it is packaged and shipped for burial at a licensed commercial disposal site and thus does not become an effluent to the environment.

Most of the fluorine added to the fuel cycle during the UF_6 production step is removed and precipitated as CaF_2 in the fuel fabrication step. The 26 MT of precipitated calcium fluoride per annual fuel requirement, occupying a volume of approximately 11 cubic yards, may be buried in trenches on the site of the fuel fabrication plant and covered with backfill.

(2) Radiological

(i) Gaseous

The most significant gaseous radiological release from the fuel cycle derives from the fuel reprocessing step. Nearly all of the krypton-85, most of the tritium (in the model plant, 13% of the tritium is released directly to the watershed) minute quantities of radioiodine, other fission products, and transuranic isotopes created in the nuclear reactor fuel are released as particulates to the atmosphere

from the reprocessing plant operations. However, the estimated annual radiation doses from the model plant to an individual at the site boundary are approximately 2.5 mrem to the whole body, 4.2 mrem to the bone, 6.3 mrem to the thyroid, and 9.25 mrem to the outer layer of skin.

The long-term equilibrium buildup of Kr-85 in the atmosphere, due to one model 1000 MWe LWR, will eventually contribute approximately 120 man-rem annual whole body exposure to the entire population of the northern hemisphere (4 billion people). For comparison, the annual population dose to the same number of people from natural background radiation is approximately 500 million man-rem.

Tritium released from reactor fuel reprocessing can also increase the exposure of the world population. Dose to the U.S. population from the inventory of world wide reactor produced tritium is estimated to be 0.0006 millirem/yr.

Small quantities of uranium and its daughters are released to the atmosphere in several steps of the fuel cycle. Data are unavailable for the total quantity of activity released from the mining operation, but attempts to measure radon concentrations in an open-pit mine revealed no significant alpha concentrations. Esti-

mates of the site boundary concentration of thorium-230 from the model mill are approximately 15% of the 10 CFR 20 limit. In all other cases, the concentrations of uranium and its daughters are estimated to range from 1-4% of the 10 CFR 20 limits for unrestricted areas.

(ii) Liquid

In the fuel reprocessing for a model LWR annual fuel requirement, approximately 2500 curies of tritium, 0.15 curies of ruthenium-106, .075 curies of Cs-137, and .004 curies of Sr-90 are released in the liquid effluent from the model plant.

Small quantities of uranium and its daughters are released in liquid effluents from each step of the fuel cycle. In the mining operation, several curies of activity are dissolved and suspended in the mine drainage water and returned to the ground. At the mill, approximately 2 curies of activity per annual fuel requirement are discharged in the tailings solution and thus are returned to the ground. In the remaining components of the fuel cycle, small quantities of radioactivity are released to receiving bodies of water. Offsite measurements in the vicinity of a UF_6 production plant indicate that annual mean radionuclide concentrations are maintained below 5% of the 10 CFR 20 limits. Estimates of the concentrations of radionuclides in effluent streams

from enrichment and fuel fabrication plants indicate that concentrations are below 1% and 10% respectively of the 10 CFR 20 limits before dilution in receiving waters.

(iii) Solid

The most significant solid radiological waste consists of the fission products separated from the spent fuel of an annual fuel requirement in the reprocessing operation. These high level wastes will be stored onsite for a maximum of 10 yrs., and will ultimately be shipped, probably by rail, to a Retrievable Surface Storage Facility (RSSF). The RSSF will be established to store and manage high level solid wastes under constant surveillance for up to 100 years, or until such time as a more permanent Federal repository can be established. The facility will be designed to prevent the release of significant amounts of radioactive material to the environment under all credible environmental conditions and human actions. Therefore, such wastes will not be released as effluents to the environment.

The fuel element hulls and other fuel element parts contaminated with trace quantities of uranium, transuranics and fission products will be buried onsite at the reprocessing facility in a retrievable form and may be eventually shipped to the RSSF. Other low specific activity ma-

terial, such as laboratory wastes, may be buried onsite or at a commercial burial ground.

Other than high activity solid wastes from UF_6 production, fuel fabrication, and reprocessing facilities amounting to a few curies per annual fuel requirement are packaged and shipped by truck to a licensed commercial burial site. The geological and hydrological characteristics of these burial sites are such that little or no migration of radioactive material from the site is postulated. The burial sites are enclosed by fences and access is controlled.

The solid waste tailings from the milling operation, which contain most of the uranium daughter products originally in the ore (approximately 600 curies per annual fuel requirement), are slurried in the waste milling solutions. The solutions are pumped to the tailings retention pond and consequently the activity is contained onsite.

The public is exposed to a small amount of direct radiation exposure during the normal shipment of solid wastes. Approximately 600,000 people along the route of travel will receive a population dose of roughly 0.036 man-rem during the rail shipment of high level solid wastes from the fuel reprocessing plant site to the Federal storage facility. The

population dose to approximately 200,000 people from the truck shipments of low specific activity solid wastes to commercial burial sites consists of roughly 0.011 man-rem. These dosages constitute less than 0.000006% of the natural background radiation.

(3) Thermal

Approximately 3.4×10^{12} Btu of waste heat are discharged to the biosphere in the production of a model LWR annual fuel requirement. For purposes of comparison, the waste heat from the annual operation of a 1000 MWe model LWR is approximately 50×10^{12} Btu. Thus, the thermal effluents from the supporting fuel cycle constitute less than 7% of the thermal release from the model LWR.

About 95% of the waste heat from the supporting fuel cycle originates in the uranium enrichment step. In this step, 1.6×10^{12} Btu are discharged to water bodies at the supporting electric power stations (assuming that the power stations that supply electricity to the gaseous diffusion plants utilize once-through cooling), 0.5×10^{12} Btu are discharged to the atmosphere through the stack at the electric power stations, and 1.1×10^{12} Btu are discharged to the atmosphere at the gaseous diffusion plants from cooling towers.

The operation of cooling towers leads to local misting and fogging under certain meteorological conditions. At the gaseous diffusion plants, however, this effect does not extend

beyond the site boundaries. The impact of the thermal discharge to water bodies is difficult to estimate, since the power is drawn from the grids of large utility complexes and the heat is dissipated to a number of receiving bodies of water.

(c) Accident Considerations

The history of the nuclear fuel cycle to date indicates that accidents in fuel cycle facilities which could result in significant effects on the offsite environment are highly improbable. This record of the commercial nuclear fuel cycle industry has been accomplished by the consideration of safety as a controlling factor in all its functions. Each applicant in his license application is required to analyze potential conditions that could result in the release of radioactivity beyond the plant confines and by proper design, construction and operation to minimize such releases. As a further assurance, the Regulatory Staff performs a detailed independent safety evaluation of each commercial fuel cycle facility which includes at least the following elements:

(1) *Site Analysis* — Site conditions such as geography, meteorology, hydrology, and seismology are reviewed; in addition, maximum natural phenomena criteria are considered in the case of plutonium plants and reprocessing plants.

(2) *Process Evaluation* — The process flow sheet is reviewed in detail to identify potential effluents and safety problems during normal and abnormal operations.

(3) *Structures and Systems* — The building itself, including modules, layouts, etc., is reviewed for safety, emergency escape, limiting the spread of contamination and prevention and control of fires.

Systems — Ventilation, air cleaning, waste treatment, safety instrumentation and monitoring systems are analyzed for suitability under normal and abnormal conditions.

Equipment — The adequacy and reliability of the process and utility equipment are reviewed including the Quality Assurance (QA) on design, construction, installation, operation, and maintenance. For plutonium conversion and fabrication facilities and for reprocessing plants, Appendix B of 10 CFR 50 covering QA requirements is a requirement.

(4) *Radiation Safety and Nuclear Safety Programs* — The review includes contamination control considerations, ventilation system performance, exposure assessment for workers and control of such exposure. Effluents and effluent treatment and monitoring systems for both liquid and gaseous streams leaving the plant are evaluated. Accident analyses that include consideration of criticality, radiation safety, and nonradiation safety problems are performed. In the fuel cycle plants handling special nuclear material, both liquid and solid systems are evaluated for criticality safety.

(5) *Procedures* — The licensee is required to have detailed operating and maintenance procedures. The training and testing programs for

operators are reviewed. Particular attention is given to fuel reprocessing plant operators who are tested and licensed by the AEC. The licensee must provide a corporate hazard committee or some similar organization that has responsibility for review of new processes and plant changes. Safety audits of operations are required to be made by the licensee who must report the results of these audits.

Emergency plans are submitted by the licensee and are reviewed for adequacy and detailed coverage. Emergency plans are required for all the special nuclear material plants and for fuel reprocessing plants in accordance with licensing conditions or Appendix E of 10 CFR 50.

(6) *Materials and Plant Protection Evaluation* —

In addition to the licensing functions of health and safety evaluation is the safeguards program of the applicant for the control of special nuclear material and the means by which he intends to protect those materials against theft, diversion, or sabotage.

In addition to requirements for care in design, construction, and operations of nuclear fuel cycle facilities, each licensee is required to report incidents to the cognizant AEC Regulatory Operations office which either have or threaten to cause any of the following types of events:

(i) Radiation exposure of individuals beyond stated limits.

(ii) Release of radioactive materials in daily averaged concentrations of more than 500 times limits specified in 10 CFR 20, Appendix B, Table II.

(iii) A loss of operations of any affected facility for a period of greater than one day.

(iv) Damage to property of over $1000.

The information in these reports is used as a basis for corrective action to prevent similar events from occurring in existing plants and is taken into account in the licensing actions on new or modified facilities of a similar nature. Such information is also evaluated to determine the need for new or modified standards and criteria.

The effectiveness of these measures to date is borne out by the fact that the incidents which have occurred in fuel cycle facilities in this country to date have neither resulted in significant injury nor endangered the health of any individual in the general public. Nevertheless, for each licensed operation of the fuel cycle, a series of potential accidents with environmental effects judged to range from trivial to serious have been postulated and evaluated in the safety analysis that is performed before the individual facility license is issued. Records to date indicate few if any of the routine type accidents involving special nuclear material have had any measurable effects on the environment. Thus, the review of accidents for this statement has been con-

centrated upon the most serious accidents that either have occurred or realistically can be postulated. The estimated radiological environmental effects of the most significant of these accidents are summarized in Table S-5 which lists the resulting calculated radiation exposure in unrestricted areas.

No criticality incident has occurred in the United States during the processing of low enrichment uranium.* Equipment design, system parameters, and administrative procedures in fuel cycle facilities handling enriched uranium require that two independent errors be necessary for the occurrence of an accidental criticality, reducing the probability of an accidental criticality event to an extremely low value. The resulting dose from such a highly unlikely criticality incident is considerably greater than the annual dose from background radiation; however, it is lower than the maximum annual dose permitted by 10 CFR 20 for occupational exposure.

*Although no such incident in the rest of the world is known to us, our information may be incomplete.

TABLE S-5

SUMMARY OF OFF-SITE EXPOSURES FROM POSTULATED ACCIDENTS

Accident	Fuel Cycle Component	Calculated Off-Site Exposure (rem)	Principal Affected Organ
Criticality Incident*	Fabrication	6.6	Thyroid
		1.3	Whole-body
UF_6 Cylinder Rupture	UF_6 Production Enrichment	0.4	Bone
UF_6 Cylinder Rupture	Fabrication	0.1	Bone
Criticality Incident*	Enrichment	0.061	Thyroid
		0.08	External Neutron and Gamma (Whole-body)
Criticality Incident	Reprocessing	0.04	Thyroid
UF_6 Loadout System Leak	Reprocessing	0.01	Bone
Storage Pool Cooler Leak	Reprocessing	0.01	Bone

A rupture or valve failure in a UF_6 cylinder is unlikely, but incidents of this nature have occurred in the past. An accident of this type could occur under varying conditions at a UF_6 plant, enrichment plant, or fuel fabrication facility. In estimating the offsite doses from this postulated accident, assumptions were made regarding the quantity released, the effectiveness of filters, and meteorological conditions. The calculated radiation doses are higher than the average annual dose from natural background radiation but are within the limits of 10 CFR 20 for unrestricted areas. The postulated accident at the UF_6

*Very improbable, has never occurred with low enriched uranium.

plant results in the highest offsite effects since it is assumed that the UF_6 cylinder malfunction occurs out-of-doors. Additionally, the fluoride release associated with the accident could result in some localized injury to plant life.

The accidents which were hypothesized for the mining, milling and waste management components of the fuel cycle do not result in significant offsite releases, or at worst entail limited decontamination efforts in the immediate vicinity of the site. The Federal facility for the interim storage of high level wastes will be designed to withstand all natural forces and man-created accidents so that there will be no significant release of radioactive materials to the environment outside of the facility.

It is estimated that 2.8 accidents involving truck shipments of non-enriched fuel cycle material could occur per thirty year lifetime of a model LWR. The low specific activity of the materials would limit the effects of a breach of containment to minor consequences. The likelihood of a criticality incident occurring during a truck shipment of fissile material is estimated to be infinitesimally small. Finally, it is estimated that 0.05 rail accidents involving the shipment of high level wastes to a Federal storage facility might occur per thirty year lifetime of a model LWR. Containers for high level waste must be designed and constructed to withstand accidents likely to be encountered in transport.

6. *Overview of Total Nuclear Fuel Cycle*

The environmental effects of the total nuclear fuel cycle have been estimated for mid-1972 and for the projected installed nuclear power generation capacity for 1979-1980. In mid-1972 approximately 10-12,000 MWe of nuclear electric generation capacity is estimated to be in operation in the United States. The projected installed nuclear electric generation capacity for 1980 is 140-150,000 MWe. Table S-6 summarizes industry demands and the number of plants for each fuel cycle step operating in 1972 and estimated required capacity and number of plants required to service the 1980 nuclear electric power generation industry. The environmental considerations for operations have been summarized in Tables 0-4, 0-5, 0-6, 0-7, 0-8, and 0-9. These data characterize the environmental effects of each individual fuel cycle plant. The environmental effects of the total fuel cycle may be obtained by combining the data in Table S-6 for the required number of plants with the corresponding information from Tables 0-4 through 0-9.

Uranium Mining

The existing uranium mining industry can produce about 30% more ore than is required by the nuclear electric generation capacity on-line today. By the end of the decade, the required mining rate must triple to meet the demand. Since the bulk of the known reserves are in New Mexico, Wyoming, Texas, Colorado and Utah, it is expected that the mines will be concentrated in that area. The only anticipated change in mining techniques is that a greater fraction of the ore mined in 1980 may come from underground mines, since a larger percentage of reserves are found at depths only amenable to underground mining.

Uranium Milling

The uranium milling industry is capable of supplying about twice today's nuclear power generation requirements of yellowcake; by 1980, the yellowcake demands are expected to quadruple. It is expected that the number of mills will more than double but it is likely that the technology employed will be similar to today's. The new mills are expected to be located in the Western States in the vicinity of mining operations.

UF_6 Production

It is anticipated that the 1980 requirements for UF_6 can be met by planned UF_6 conversion operations at the reprocessing plants and increases in the plant capacity of the existing facilities and by construction of several new UF_6 plants. No technological advance is forecast at this time.

Isotopic Enrichment

Planned improvements to the government owned complex of isotope enrichment plants will permit the existing plants to supply the amount of separative work required to service the 1980 installed nuclear electrical generation capacity. Since some of the electrical supply for the isotope separation plants is planned to come from nuclear power by 1980, it is estimated that there will be no increase in the gaseous chemical effluents from the enrichments plants despite a 70% increase in separative work capability.

Fuel Fabrication Plant

The fuel fabrication plant industry is presently serviced by 10 plants, some of which are not expected to be in use in 1980. A total of 8 to 10 production plants,

TABLE S-6

TOTAL NUCLEAR FUEL CYCLE INDUSTRY

Types of Plants	1972			1980 (est.)		
	Plant Size Thousands of MT	Annual Requirement Thousands of MT	No. of Average Plants Required to Meet Power Demand	Annual Requirement Thousands of MT	No. of Average Plants Required to Meet Power Demand
Uranium Mines — Ore	250-750	4,500	10 (220)*	17,000	30-40
Uranium Mills — U_3O_8	0.5-1.1	9	12 (20)*	34	40-45
UF_6 Production — U	5-15	8	1+ (2)*	34**	3 Low Enriched Plants & 3-4 Natural Plants
Isotopic Enrichment SWU	7.5	5	1 (3)*	20	3
Fuel Fabrication — U	0.3-1.2	1.2	3+ (10)*	5.3	8-10
Fuel Reprocessing — U	0.3-1.5	0.2	1 (2)*	3	3-4

*Number in parentheis is number of plants actually available.

**Including recycle of recovered U from reprocessing operations.

Nuclear Power Generation Basis: 10–12,000 MWe 1972
140–150,000 MWe 1980

having a combined throughput of over 5000 MTU of fuel per year, will be required to service the 1980 industry. There are new processes under development in the conversion portion of the fuel fabrication step of the fuel cycle. These new processes are expected to reduce substantially most of the chemical process effluents from fuel fabrication.

Fuel Reprocessing

Three fuel reprocessing plants either exist or are under construction in 1972. It is expected that one additional plant will be built and operating in 1980 to meet the reprocessing load. No major technological advances for these plants are predicted.

Waste Management

The volume of other than high level wastes, i.e., those which may be buried in commercial burial grounds, will increase in about the same ratio as nuclear generation capacity. It is expected that the existing burial grounds will be adequate to handle the 1980 volume of wastes. At the present time and through 1980 high level wastes may be stored at the fuel reprocessing plant site as liquids and solids. This onsite storage does not impose significant environmental effects.

It is expected that by 1980 the Retrievable Surface Storage Facility for storage of solidified high level wastes will be under construction. Hence, at some time after 1980, the high level wastes as solids will be transferred from the reprocessing plant to the Federal facility.

Transportation

At the present time, the transportation needs of the fuel cycle supporting the installed nuclear electric generation capacity can be met by about 1400 truck

shipments per year on public highways. The movement of low specific activity material accounts for most of that total. By 1980, the number of truck shipments could exceed 16,000, however, the use of rail transport may reduce this volume of highway movements. The amount of material shipped will continue to be an inconsequential fraction of the total transportation industry.

F. *IRRADIATED FUEL REPROCESSING*

1. *Summary*

(a) General

Fuel reprocessing recovers the unused fissile material and separates the fission products from the spent fuel discharged by the power reactor. By the middle of the 1970's, three reprocessing plants, with an estimated combined annual capacity of 2700 MTU may be in operation in the United States. The three reprocessing plants are generally similar in regard to process technology, all using mechanical means for cladding destruction and adaptations of the Purex process for a part or all of the separations.[1]

The collective operation of the three plants, normalized to an annual capacity of 900 MTU/yr, is selected as the model reprocessing plant. This capacity is equivalent to the annual fuel requirements of approximately 26 model LWR's.

(b) Environmental considerations

The major environmental considerations associated with irradiated fuel reprocessing, normalized to a model LWR annual fuel requirement, are summarized in Table F-1 and as follows:[2]

TABLE F-1

Summary of Environmental Considerations For Irradiated Fuel Reprocessing (Normalized to Model LWR Annual Fuel Requirement)

	Total
Natural Resource Use	
Land (acres)	
Temporarily committed	3.9
Undisturbed area	3.7
Disturbed area	0.2
Permanently committed	0.03
Water (millions of gallons)	
Discharged to air	4.0
Discharged to water	6.0
Total	10.0
Fossil Fuel	
Electrical energy (thousands MW-hr)	0.45
Equivalent coal (thousands MT)	0.16
Effluents	
Chemical (MT)	
Gases	
*SO_x	6.2
**NO_x	7.1
*Hydrocarbons	0.02
*CO	0.04
F–	0.11
Liquids	
$Na+$	5.3
Cl^-	0.2
$SO =$	0.4
$NO\frac{4}{3}$ (as N)	0.2

*Estimated effluent gases from combustion of equivalent coal for power generation.

**23% of total is estimated effluent gas from combustion of equivalent coal for power generation.

TABLE F-1 (Contd.)

Summary of Environmental Considerations For Irradiated Fuel Reprocessing (Normalized to Model LWR Annual Fuel Requirement)

	Total
Effluents	
Radiological (Ci)	
Gases (including entrained matter)	
Tritium (thousands)	16.7
Kr-85 (thousands)	350
I-129	2.4×10^{-3}
I-131	2.4×10^{-2}
Fission products	1.0
Transuranics	4×10^{-3}
Liquids	
Tritium (thousands)	2.5
Ru-106	0.15
Cs-137	0.075
Sr-90	0.004
Thermal (billions of Btu's)	61

(1) Use of Natural Resources

The temporary land use of 3.9 acres comprises roughly 6% of the land use for the total fuel cycle. About 95% of this land use is a fenced in buffer zone and is not disturbed. Less than 0.03 acre per annual fuel requirement is permanently committed. The water use of 10 million gallons comprises about 3% of the water use for the total fuel cycle. Approximately 40% of the water is redistributed through evaporation. The electrical energy requirement of 450 MW-hr. comprises approximately 0.15% of the consumption of electrical energy in the total fuel cycle and is equiva-

lent to the output of the model LWR for less than ½ hr.[3]

The fuel reprocessing component of the nuclear fuel cycle contributes significantly to the conservation of natural resources. The values recovered from the spent fuel can be measured in terms of about 30,000 MT of conserved uranium ore and bred and recovered fissile material worth $1.75 million per model LWR annual fuel requirement.[4]

(2) Effluents

The total radioactivity of airborne radioactive effluents from fuel reprocessing is large (about 65% of the airborne radionuclides) in comparison with the remainder of the fuel cycle. Assuming that all of the Kr-85 and most of the tritium (87%) produced in the nuclear power plant fuel is released to the air during the fuel reprocessing step, the estimated annual whole-body exposure at the site boundary from gaseous effluents is less than 3% of the natural background radiation throughout most regions of the country.[5]

Nearly all of the fission products created in the nuclear reactor are removed from the uranium in the fuel reprocessing step. The activity of the fission products 150 days after discharge from the model reactor is reduced by radioactive decay to roughly 150 megacuries per model LWR annual fuel requirement.[6] The high-level wastes containing most of this radioactivity are stored as liquids in

carefully designed, built and monitored tanks, within vaults, at the fuel reprocessing site for up to 5 years after separation. Eventually they will be converted to inert solids, and will be shipped to a Retrievable Surface Storage Facility within 10 years after separation, and thus isolated from the environment.[7]

Only one of the three plants, Nuclear Fuel Services, comprising the irradiated fuel reprocessing industry discharges radionuclides directly to the watershed. According to measurements made in 1971, the maximum concentrations of tritium and Ru-106 released from processing 69MT of fuel did not exceed 4% of 10 CFR 20 annual average concentration limits in off-site waters.[8] If this plant operated at 300 MT fuel/year, the tritium concentration in off-site waters could reach about 15% of 10 CFR 20 limits. With improved Ru-106 recovery, off-site concentrations of this isotope would be about 0.4% of 10 CFR 20 limits.

Oxides of nitrogen and fluorides are the most significant gaseous chemical effluents from the fuel reprocessing plant. However, the estimated concentrations of NO_x at the site boundaries are more than two orders of magnitude below the 100 $\mu g/m^3$ EPA standard, and the predicted concentrations of fluorides are within the most restrictive State standard of 0.5 $\mu g/m^3$.[9] One of the plants comprising the irradiated fuel reprocessing industry releases chemicals to off-site waters. The incremental increase in concentrations in the receiving

waters is roughly 1 ppm or less, a negligible amount for the chemical species involved.

Some heat, much of it originating from the decay of fission products in stored high level wastes, is discharged to the atmosphere. This thermal effluent amounts to slightly over 1% of that for the total fuel cycle.

(3) Accident Considerations

Fuel reprocessing plants are designed to assure adequate margins of safety to prevent accidents, and to assure that acceptable protection systems will function reliably to mitigate the consequences of accidents if they should occur as a result of multiple failures of systems or procedures that are provided to prevent accidents. A broad spectrum of accidents are analyzed, which range from minor process leaks or spills of radioactive material within the plant and/or its laboratory to credible major accidents such as, but not limited to, criticality incidents, solvent fires, hydrogen explosions, ion exchange resin fire, and typical accidents related to the handling and storage of radioactive materials. Credible accidents are treated as if they might occur during the life of the plant (irrespective of their low probability of occurrence) and the environmental consequence of the release of chemical or radioactive material that might result if the accident should occur is analyzed.[10]

The most significant accidental off-site exposure could result from an accidental criti-

cality incident in these plants. If such an event were to occur, an individual at the site boundary could receive a dose to the thyroid of approximately 40 mrem.[11] In general, other postulated accidents could result in off-site exposures of 10 mrem to the bone of individuals near the site boundary via inhalation and ingestion of fission product and transuranic radionuclides dispersed into the atmosphere by accidental releases. It is significant to note, however, that in more than 25 years of fuel reprocessing experience using similar processes at government owned plants, there has been no accident that has resulted in the release of significant radioactivity to the off-site environs. Based upon the extensive safety measures instituted in new commercial facilities, at least as good a safety record is expected.

(4) Contributions to the General Exposure

The reprocessing plants described in this chapter release all of the noble gases (predominantly Kr-85) and all of the available tritium present in the uranium dioxide fuel 150 days after shut down. A small fraction of the iodine isotopes, and small amounts of mixed fission products and actinides are also released. In the case of NFS, some part of the release is in a low level liquid waste stream.

Kr-85 and H-3 can increase the exposure of the general population. U. S. EPA estimates whole body annual exposure from all reactor produced Kr-85 will be about 0.003 mrem/per-

son in 1980,[12] compared to about 100 mrem/person from natural background. The H-3 produced in all reactors world-wide is estimated to give an annual dose of 0.0006 mrem/person in 1980.[13]

The annual exposure to the population within a 50-mile radius of the model reprocessing plant is estimated to be 167 man-rem, corresponding to 6 man-rem/annual fuel requirement. The average annual dose/person within the 50-mile radius is about 0.055 mrem/person.[14]

2. *Description of the Irradiated Fuel Reprocessing Industry*

Irradiated fuel reprocessing recovers usable fissile material from spent reactor fuel elements. During the operation of a reactor, the buildup of fission products and depletion of fissile material requires that the operator replace between one-fifth and one-third of the fuel elements annually and redistribute the other partially spent fuel in the reactor core. The discharged fuel elements contain about one-third of the uranium-235 that was in the fuel prior to irradiation, and the fissile plutonium that was produced from uranium-238 during irradiation. At present, the recovered uranium-235 is recycled in reactor reload fuel. In the future, the bred plutonium may be used as LWR reload fuel or as fuel in liquid metal fast breeder reactors. At present, the plutonium is isolated and stored.

There are economic and technical considerations which favor recovery and recycle of fissile material from the spent fuel elements. The net value of the residual fissile material, allowing for costs associated with re-

processing, waste disposal, and transportation services, is approximately $50,000 per ton of irradiated fuel. Based on 35 metric tons of uranium reprocessed per year in support of a model 1,000 MWe LWR, the reclaimable fissile material has a net worth of about $1.75 million dollars. These economic savings are reflected in lower electric power costs. The recovered fissile material from an annual fuel requirement also represents the conservation of natural resources equivalent to approximately 30,000 MT of uranium ore.[15]

At present there are three fuel reprocessing plants in operation or being constructed in the United States. One plant has been in operation since 1966, but is presently shut down. Another is nearly completed and will be ready for operation in 1974. The third plant is in an early stage of construction and scheduled for operation in late 1976. The three plants have a combined design capacity to meet the projected needs for fuel reprocessing services until late in the 1970's.[16]

The first commercial fuel reprocessing plant, the Nuclear Fuel Services (NFS) facility, can process irradiated light-water power reactor fuels at the rate of 1 MTU/day. In anticipation of the need for additional commercial services, NFS is giving consideration to increasing the plant's capacity to 900 MTU/year (3 MTU/day).

The second commercial fuel reprocessing plant, the Midwest Fuel Recovery Plant (MFRP), will be ready for operation in 1974. It has a design capacity of approximately 300 MTU/yr.

The Barnwell Nuclear Fuel Plant (BNFP), which will be the third irradiated fuel reprocessing plant, is in its early stages of construction. It is scheduled to

begin operating in late 1976, and will have sufficient capacity to process 1500 MTU/yr.

Each of these plants is located on a relatively large, remote site. Site location, size and demography data for each plant are given in Table F-2. In general, the three fuel reprocessing plants are similar in respect to process technology. All plants utilize mechanical means for breaking up the fuel elements and chemical systems for recovering special nuclear material which are adaptations of the Purex process, for which the technology and risks are well defined. However, specific methods applied for mechanically disassembling the fuel elements, dissolving fuel materials, and applying separation technology to recover fissile materials differ somewhat from plant to plant. A simplified block flow diagram for the plant is given in Figure F-1.

Spent fuel element assemblies are received at the reprocessing plant via truck or rail in heavily shielded shipping casks. The assemblies are spaced arrays of sealed tubular rods containing UO_2 pellets which have been partially transformed into PuO_2, fission product oxides, and gases by irradiation. The tubes encapsulating the fuel are made of zircaloy or stainless steel.

After storage to permit short half-life radionuclides to decay (150 days), the fuel elements are chopped into short pieces, exposing the metal oxides. The metal oxides are leached by hot nitric acid, leaving behind the chopped tubing (hulls). The hulls are soaked in hot nitric acid and water to assure that essentially all of the uranium, transuranics and fission products have been removed. The nitric acid solution, containing uranium, transuranics and fission products, is adjusted chemically and processed through solvent extraction

TABLE F-2

IRRADIATED FUEL REPROCESSING PLANTS SITE DATA AND DEMOGRAPHY[17]

Plant and Location	Site Size, Acres	Population Density people/ sq. mi.	Population of Nearby Cities		
			City	Population	Distance, Miles
Nuclear Fuel Services, West Valley, N.Y.	3350	90	Buffalo	463,000	28
			West Valley	<1,500	4
Midwest Fuel Recovery Plant — Morris, Ill.	890*	150	Morris, Ill.	8,000	8
			Joliet, Ill.	79,000	15
			Aurora, Ill.	74,000	27
Barnwell Nuclear Fuel Plant — Barnwell, S.C.	1700**	35	Barnwell, S.C.	4,500	7.5
			Aiken, S.C.	16,000	26
			Augusta, Ga.	60,000	33

*Adjacent to the Dresden nuclear reactor site of 2,230 acres.

**Adjacent to AEC Savannah River Plant exclusion area.

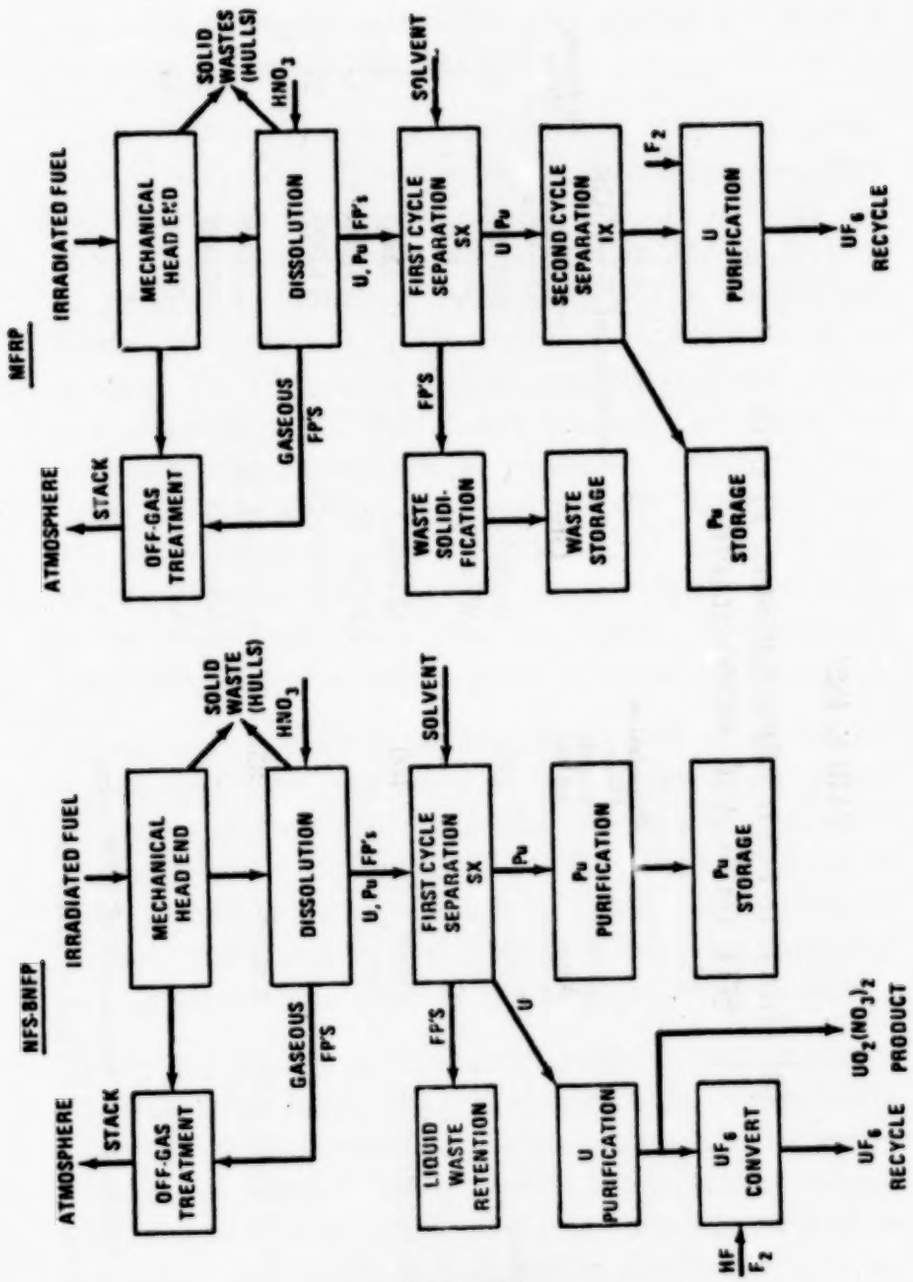

Figure F-1
FUEL REPROCESSING
SIMPLIFIED BLOCK FLOW DIAGRAM

and ion exchange systems. These process steps separate the fission products, uranium, and plutonium, from each other. The purified uranium product is converted to uranium hexafluoride (UF_8) and is shipped to the gaseous diffusion plant for reenrichment. The purified plutonium product will be stored pending conversion to PuO_2 for use in future plutonium recycle or breeder reactor fuel elements (MFRP also recovers and stores neptunium).

In fuel reprocessing technology today, there are two classes of radioisotopes, noble gases and tritium, most of which are released from the fuel to the environs.

Noble gases — Krypton 85 is the dominant noble gas present after 150 days cooling (>99.9% of the noble gas activity comes from Kr-85). It is released quantitatively from the fuel.

The continuous release of all Kr-85 formed in a 1000 MWe reactor can contribute 120 man-rem/year to the entire population of the northern hemisphere; natural background contributes 400 million man-rem/yr. Thus there does not appear to be any significant increase in background from Kr-85 release for many years to come. There is ongoing research sponsored by the U.S. AEC devoted to developing a method for removing Kr-85 from reprocessing off-gases.

Tritium — The behavior of tritium in LWR fuel has been the subject of ongoing study.[18] Tritium can react with Zircaloy to form a solid zirconium compound. It has been reported that from 30-60% of the total tritium formed in the fission process remains with the zirconium hulls. No data are

available on the leaching of tritium from zirconium by nitric acid.

A substantial fraction of the remaining tritium in the fuel remains with the high level liquid waste, but will eventually be released when that waste is solidified. Hence all tritium in the fuel that does not tritide will eventually be released from the reprocessing plant.

In the case of NFS, it has been found that about 40% of the tritium from the plant is released in a low level liquid stream.[19] It has been assumed in this survey that 100% of the tritium formed in the fuel is released in reprocessing.

In the reprocessing operation, certain other radioisotopes are released from the plant stack in small amounts after treatment. Iodine, other fission products, and transuranics may be released. All gaseous effluents are discharged to the atmosphere via off-gas treatment and filtering systems which are designed to remove over 99.9% of the radioactive iodine gas, the radioactive fission products and transuranic particulates.

Of the three commercial reprocessing plants built or being constructed, only NFS has a low level radioactive liquid effluent. In the past, NFS has released tritium, ruthenium, strontium , and cesium isotopes, as well as small amounts of other isotopes; NFS has installed a low level waste treatment system designed to improve the quality of the low level waste discharged (i.e., reduce its radioactivity level). Accounting for creek dilution, values offsite for cesium and strontium have been assumed to be less than 0.1% of MPC.

The major waste systems for each of the three plants are described in Table F-3.

TABLE F-3
IRRADIATED FUEL REPROCESSING PLANTS
MAJOR WASTE SYSTEMS*

Plant	Gaseous Effluents	Liquid Wastes		Solid Wastes(3)
		High-Level	Other Than High-Level	
NFS	To atmosphere via Iodine Scrubber, HEPA filters, 61 meter stack	Stored onsite as neutralized liquid in tanks in vault(1)	Tritium and Ru-106 controlled release to creek, other isotopes <0.1% of 10 CFR 20 in off-site waters	Stored onsite in drums in impervious clay deposits
MFRP	To atmosphere via Iodine Scrubber, sand filter, 91 meter stack	Converted to solid. Stored onsite in containers under water in storage basin	Stored onsite in tanks in vault as immobile salt cake	Stored onsite in underground lined vault
BNFP	To atmosphere via Iodine Scrubber, HEPA filters, 100 meter stack	Stored onsite as acidic liquid in tanks in vault(2)	Stored onsite in tanks in vault	Stored onsite in underground concrete drums

(1) Plans underway to add tanks for storage of high-level liquids in acidic conditions with ultimate conversion to solids for transfer to a Federal storage facility.

(2) Plans for solidification of high-level liquid wastes for transfer to the Retrievable Surface Storage Facility.

(3) All facilities ship other than high-level solid wastes to commercial burial grounds for long-term storage, with the exception of hulls and fuel hardware which are stored onsite as indicated above.

*The information on this table has been compiled from Safety Analysis Reports from the facilities.

Each plant has provisions for complete containment of high-level liquid wastes in high integrity tanks in vaults or as an immobile solid as shown in Table F-3. The plans vary somewhat, but all result in total retention of the high-level wastes with no release to the environment. Within five years all high-level liquids will be converted to solids and within ten years will be transferred to a Federal storage facility for long-term confinement.[20] Solid waste materials such as hulls and fuel hardware are stored onsite in underground vaults, concrete containers or in impervious soil.[21] Other low-specific activity solid wastes are packaged and shipped to commercial burial grounds for long-term storage. There will be essentially no release of solid radioactive wastes to the offsite environment from any plant.

Plans are under way or under consideration for all three of the plants to process the recovered uranium values to hexafluoride to be recycled through the gaseous diffusion plants. Uranium hexafluoride production results in some nonradioactive chemical effluents of fluoride bearing compounds. The recycled uranium can represent as much as one-third to one-fourth the amount of natural feed to the enrichment operation, so that the potential impact of the fluorination operation at the reprocessing plant corresponds to a fraction of the total environmental impact associated with UF_6 production.

Pending development of a future market for the plutonium product recovered by reprocessing nuclear power reactor spent fuel, the fuel reprocessors tentatively plan to store the plutonium product for the utilities as part of their services. The plutonium product can be stored safely in special containers and facilities

specifically designed for this purpose. The storage of plutonium product at the reprocessing site has been considered in licensing safety evaluations and with respect to the environmental impact of irradiated fuel reprocessing as a whole.

By 1975, the annual quantities of plutonium recovered by reprocessing nuclear power reactor spent fuel will be in the range of 2-3 metric tons; by 1980 about 15 metric tons; and will increase more rapidly thereafter.[22] The feasibility of using about 3 weight percent plutonium in a mixed plutonium-uranium oxide fuel for LWR's has been demonstrated.[23] However, the prospective utilization of such plutonium recycle fuel is somewhat uncertain since the actual timing and the extent to which the recovered plutonium will be recycled is an economic matter to be considered by each utility. Moreover, although several firms have indicated plans to provide production-scale, mixed oxide fuel fabrication plants by 1975 or 1977, the present capability for fabricating such fuel is limited. Accordingly, pending development of the plutonium recycle economy, limited means for storing the recovered plutonium product inventory will be provided at the three reprocessing plants.

The New York State Atomic and Space Development Authority (ASDA) has constructed a plutonium storage facility, for the above purpose, at its Western New York Nuclear Service Center, West Valley, New York.[24] This facility is specifically designed to eliminate the possibility of any significant radiation exposure, criticality incident, or other accidents that might be related to the storage of plutonium in sealed containers. It can store 2 metric tons of plutonium as nitrate in a nitric acid solution. The plutonium nitrate

solution is contained as follows: (a) in a 10-liter polyethylene bottle, (b) that is sealed within a 304 L stainless steel 14-gauge tubular capsule, (c) which is inserted in an eight-inch thick annulus of reinforced concrete with seven-inch thick reinforced concrete bottom and top cover disks, and (d) all of the above are contained within a sealed steel drum. Approximately 1000 such containers can be stored in this facility. Similarly, General Electric Company and Allied-Gulf Nuclear Services plan initially to store Class 1 shipping containers of plutonium nitrate solution within respective protective areas of the MFRP and BNFP.[25]

As the rate of plutonium generation increases due to additional LWR's being placed in operation, other more economical means could be provided for the storage of the larger inventories of recovered plutonium product. At that time, bulk quantities of plutonium nitrate solutions could be stored in vessels within confinement structures specifically designed and constructed for that purpose, or the plutonium nitrate solution could be converted to plutonium dioxide, a solid, which can be sealed in containers and stored in vaults specifically designed and constructed for that purpose. The timing for the start of use of recovered plutonium and the rates for either recycle or storage will be dependent upon an analysis of many changing factors. At this time it is not feasible to make firm projections concerning use of recycle plutonium in LWR's beyond the indication that some recycle may be accomplished by the end of this decade.

On February 1, 1973, the AEC published new proposed requirements for measures of protection of licensed fuel reprocessors against acts of industrial sabotage.[26] All reprocessing plants are required to provide protection systems to detect unauthorized access to special nuclear materials, i.e., plutonium. Buddy systems, television coverage, perimeter lighting, fencing, and communication with local law enforcement agencies are among the systems that may be required at reprocessing plants.

3. *Environmental Studies of the Effects of Reprocessing Plants*

As stated previously, the United States Government has operated fuel reprocessing plants for over 25 years, with major facilities at Hanford (Richland), Washington and Savannah River (Aiken), South Carolina. Another reprocessing plant is located in Idaho.

NFS, operated from 1966 through 1971, is the only plant in the United States that operated commercially.

Since the normal operations of a reprocessing plant result in the release of some radioisotopes to the environment, a review of the published environmental surveys from the Hanford off-site vicinity, Savannah River Plant off-site vicinity, and the NFS plant vicinity is presented below. It should be pointed out that both Hanford and Savannah River sites contain nuclear facilities, specifically reactors, which may have released radioactivity. In addition, both sites may be larger than commercial reprocessing plants, and the fuel exposure may be significantly different than would be experienced by commercial fuel.

(a) Savannah River Plant — This plant, operated for the AEC by EI du Pont de Nemours and Company occupies 312 square miles in South Carolina. Production areas include fuel preparation area, five reactors, two fuel separations areas, and a heavy

water plant. Only three reactors are now operating.

There has been a continuous monitoring program since 1951, before plant startup, to determine the concentration of radioactive materials in a 1200 square mile area outside the plant.

Semiannual reports of the environmental monitoring are published, and are entitled "Effect of the Savannah River Plant on Environmental Radioactivity."

Reports for the period July 1963 — June 1971 were reviewed.[27] Milk has been sampled at four dairies within a 25 mile radius of the SRP over the entire period. Generally, the iodine 131 concentration was below the sensitivity of the analysis over the entire period, and was consistent with U.S. Public Health Service data over most of the United States. (In July — Dec. 1964, the SRP dairy analyses showed <11 pCi/1 of I-131, whereas USPHS showed <10 pCi/1 for the Atlanta, Georgia, Charlotte, N. C., and Charleston, S. C., milk sheds.)[28] Sr-90 and Cs-137 concentrations over the same period were consistent with USPHS values over most of the United States. Tritium in milk, usually at about 0.1% of applicable concentration guides, was ascribed to SRP operations. At SRP, the reactors are the major sources of tritium.

Radioactivity on vegetation (Bermuda grass) was also analyzed at the plant perimeter and a 25 miles radius. Gamma emitter concentration, ascribed to fallout, was lower in 1971 than in 1963; alpha emitters were of the same order of magnitude (0.2 pCi/g) in 1971 and in 1963.[29]

Analyses of algae and fish in the Savannah River are given. In 1971, du Pont reported that "Radioactive materials in fish flesh continued to be far below levels considered significant from a health standpoint."[30] Data for fish for Jan. — June 1970 are given in Table F-4.[31]

The radioactivity level of the Savannah River upstream and downstream of the plant are reported. The average concentration of any isotope did not exceed 4% of MPC over the entire period, and toward the latter portion, did not exceed 0.5% of MPC. In recent years, Beaufort County, S. C., has received some of its drinking water from the Savannah River, drawn about 90 miles south of the plant. Tritium in the water contributes about 0.17 mrem/yr to an individual drinking 1.2 liters/day. (The reactors are the source of the tritium.) Communities near the SRP obtain water from deep wells or surface streams. There is no evidence that SRP contributed to the radioactivity of public water supplies of towns around the plant, since the alpha and beta emitter concentrations in 1971 were essentially the same as before the plant started up.[32]

(b) Hanford — Operators of the Hanford site have prepared environmental surveys of the vicinity annually for a large number of years. Hanford contains reactors, fuel reprocessing plants, and isotope recovery facilities; as well as fuel fabrication and plutonium processing. Until fairly recently, the reactors operated with once-through cooling water, resulting in the addition of radionuclides from the reactor to the Columbia River. Beginning in 1971 only one production reactor, N,

TABLE F-4

RADIOACTIVITY IN SAVANNAH RIVER FISH, JAN.-JUNE, 1970

pCi/g (wet weight)

Location	Number of Fish Assayed		Type of Sample	^{137}Cs				$^{89,90}Sr$	
				Bream[a]		Catfish[b]		Bream and Catfish	
	Bream	Catfish		Max	Avg	Max	Avg	Max	Avg
Above SRP boundary	18	75	Bone	—	—	—	—	23	12
			Flesh	25	3.2	15	3.6	—	—
Adjacent to SRP	14	27	Bone	—	—	—	—	21	13
			Flesh	18	6.3	21	6.6	—	—
Below SRP at Highway 301	89	22	Bone	—	—	—	—	9	8
			Flesh	20	4.5	11	4.9	—	—

[a]Shellcracker, bluegill, and redbreast (*Lepomis*).

[b]Predominantly yellow cat (*Ictalurus*).

remained in operation. It has a closed primary cooling loop and releases only minor quantities of radioactivity to the river. Thus, the 1971 Hanford Surveillance Program shows the impact of other Hanford operations on the environment. These operations included the Purex chemical reprocessing plant, fuel fabrication for N Reactor, plutonium processing and scrap recovery, and laboratory operations.

Data presented in BNWL-1683, the 1971 Hanford Surveillance Program, shows conclusively that since shutdown of the once-through cooled production reactors, radioactivity released to the environs at Hanford has been reduced to negligible levels.[23] No unusual releases occurred in 1971 causing Concentration Guides, as given in AEC Manual Chapter 0524, Appendix, Table II, to be exceeded. All measurements of radioactivity were less than 15% of the applicable Concentration Guides. Radiation dose estimates for population groups in the plant environs for 1971 were all less than 1% of applicable standards for plant operations. Offsite measurements of other air and water quality parameters were also well within applicable criteria and showed no significant evidence of plant operations.

Highlights of the observations included:

- No measurable effect on Columbia River quality was detectable from wastes released to ground disposal sites within the Hanford plant boundaries.
- Generally, the average airborne radioactive concentrations at the Hanford boundary were the same as the more distant sampling loca-

tions, indicating that Hanford operations were not contributing significantly to offsite airborne radioactivity.

- Average I-131 concentrations in milk locally available were less than 0.5% of the Concentration Guides for water. Increases of I-131 noted in milk for the latter part of 1971 are attributed to atmospheric nuclear weapons testing.
- Cs-137 and Sr-90 were detectable in milk locally available, but concentrations were less than samples obtained from the Puget Sound area — an area of high rainfall; since Richland has a desert climate, the activity is attributed to fall-out.
- Zn-65 activity (250 days half-life) was higher in local farm food-stuffs than commercial foodstuffs and can be attributed to residual activity in irrigation waters resulting from previous reactor operation; however, fallout Sr-90, Cs-137, Ce Pr-144, Zr Nb-95 and Ru-106 activities were higher in commercial foodstuffs than in local farm foodstuffs.
- Plutonium concentrations in soil and vegetation were typical of general regional levels for the arid western states.

The data on I-131 concentrations in milk in 1971 are confirmed in earlier years' reports. The environmental surveys for 1962 and 1963 contain analyses for locally produced milk.[34] The I-131 content was generally below 3 pCi/l, although fallout from weapons testing and some period of above

normals I-131 release from the reprocessing plants caused high readings for short periods. During the 1962-1963 period, the annual average I-131 release ranged from 5 curies/week at the beginning of the period to 3 curies /week at the end of the period.

(c) NFS — The Environmental Protection Agency has recently published an analysis of environmental radiation exposures and population doses from the NFS effluents.[35] The significant radionuclides were Kr-85, tritium, Sr-90, Cs-134, and Cs-137. In 1971, NFS began operating a new low-level waste treatment system to reduce the amount of strontium and cesium in its liquid effluents. EPA concluded that the impact of this facility on humans in 1971 was well below all applicable radiation protection guides. A hypothetical individual maximally exposed locally would receive a whole body dose of 5.8 mrem/year. The plant processed 69 MT of fuel irradiated to 11000 MWD/MT in 1971. Estimating the total exposure in a 50 mile radius gave a total whole body exposure of 12 man-rem. The greatest exposure comes from tritium estimated to be present in Lake Erie, and the ingestion of deer meat. Natural background for the 0-50 mile radius is estimated at 275,000 man rem. The whole body exposure from the plant operating at 300 MT fuel/year at 33,000 MWD/MT is estimated to be 82 man-rem.

4. *Description of the Irradiated Fuel Reprocessing Model*
The mechanisms for discharge of effluents from the three fuel reprocessing plants differ somewhat. For this reason, and because it is likely during the remain-

der of this decade that these facilities will comprise the entire fuel reprocessing industry in the U.S., the collective operation of the three plants is chosen as the basis for the fuel reprocessing model.

The model plant is defined to have a capacity of 900 MTU/yr and the environmental releases and other related considerations are taken to be one-third of the aggregate for the entire industry. This capacity is equivalent to the annual fuel requirements of approximately 26 model LWR's. The model plant occupies a 2,000 acre site and operates for at least 20 years.

5. *Environmental Considerations*

a. Use of Natural Resources

(1) Land

Nearly all of the 2,000 acre site is only temporarily committed. Of this, approximately 100 acres are disturbed by plant construction and 1,900 acres remain an undisturbed exclusion area.[36]

At the end of its useful life, if necessary, the facilities can be dismantled and much of the area reclaimed. The area occupied by the plant itself and waste disposal areas probably could not be restored to its original condition. A conservative estimate is that an area of approximately 15 acres would be permanently committed.

(2) Water

Operations at the model plant will require water at the rate of approximately 600 gpm. This is equivalent to 10 million gallons of

water per model LWR annual fuel requirement. Of this, about 6 million gallons is returned to the surface water and about 4 million gallons is released to air via evaporation and drift from the cooling tower.[37]

(3) Other

The power required to operate the model reprocessing plant is approximately 1.3 MWe. The energy required to produce the annual fuel requirement for the model LWR is 450 MW-hr, which corresponds to the consumption of 160 MT of coal at a fossil fuel fired plant producing this energy.[38]

b. Effluents

(1) Chemical

(i) Gaseous

The chemical off-gas effluents from irradiated fuel reprocessing are oxides of nitrogen, fluoride (associated with UF_6 production), and combustion products from the plant's steam generators. The quantity of NO_x released from the model reprocessing plant is approximately 185 MT annually.

Extensive analyses have been made of the expected concentrations of airborne chemical effluents at the site boundary for the individual fuel reprocessing plants. The calculated site boundary NO_x concentrations are in the range of 0.1 – 1.0 $\mu g/m^3$. These concentrations are orders

of magnitude lower than the EPA standard, an arithmetic mean concentration of 100 $\mu g/m^3$.[39]

Fluoride in reprocessing plant off-gases originates almost entirely from uranium hexafluoride production. The quantity of fluoride released from the model plant is estimated to be approximately 0.1 MT annually. The calculated fluoride concentrations at the site boundaries are below the most stringent state standard for fluoride release, an arithmetic mean concentration of 0.5 $\mu g/m^3$ (State of Washington).[40]

(ii) Liquid

Only one of the three plants releases significant quantities of chemicals in liquid effluents. Table F-5 gives the most significant of these effluents. The estimated release rates are normalized to the capacity of the model reprocessing plant. This table also gives the maximum incremental increase in concentrations in off-site receiving waters. The incremental concentration increases are negligible.[41]

TABLE F-5

IRRADIATED FUEL REPROCESSING PLANTS
CHEMICALS IN LIQUID EFFLUENTS

Species	Annual Release* MT/yr	Incremental Increase in Concentration in Receiving Water △ppm
Sodium	137	1.3
Chloride	6.3	0.06
Sulfate	11.3	0.1
Nitrate (as Nitrogen)	4.8	0.04

*Normalized to the annual 900 MTU/yr capacity of the model plant.

(2) Radiological

(i) Gaseous

An irradiated fuel reprocessing plant releases airborne effluents containing krypton-85, tritium and minute quantities of radioactive iodine, other fission products and transuranic particulates which might pass through the off-gas treatment and filter systems. Table F-6 quantifies the estimated activity released annually by the model plant, and it relates this activity to the potential maximum exposure to individuals at boundaries of the plants' exclusion areas. These exposure estimates are a) uncorrected for shielding that would be provided by clothing and buildings, b) uncorrected for occupancy time in the area.[42]

On these bases, the annual exposure could be 2.5 mrem to the whole-body, 4.17 mrem to bone, 2.58 mrem to the thyroid, and 9.2 mrem to the outer layer of skin. Thus, the whole-body exposure is less than 1% of that from natural background radiation.[43] The exposures projected for skin, thyroid and bone represent approximately 0.5%, 1.0%, and 0.05%, respectively, of the guideline limits recommended by the International Commission on Radiological Protection, Report No. 9.

(ii) Liquids

Of the three facilities comprising the irradiated fuel reprocessing industry, only the NFS plant release radionuclides in liquid effluents. This results in an equivalent annual release from the model reprocessing plant of approximately 65,000 curies of tritium, 4 curies of Ru-106, 2 curies of cesium-137, and 100 millicuries of Sr-90. Using a stream flow of 358 cu ft/sec at the NFS site boundary,[44] the calculated annual average concentration of tritium is about 5% of 10 CFR 20 limits for a 1 MT/day throughput; other isotopes released at the above rates would be about 0.5% of 10 CFR 20 limits. Estimated man-rem exposure from tritium in drinking water within a 50 mile radius is 50 man-rem.

TABLE F-6

IRRADIATED FUEL REPROCESSING PLANTS

GASEOUS RADIOACTIVE EFFLUENTS[44]

Exposure Mode / Isotope	Annual Release Ci/yr	Exposure, Mrem/yr[a]				
		Whole Body	Thyroid	Bone	Exposed Skin	Lungs
Submersion						
H-3	430,000	.76	.76	.76	.76	.76
Kr-85	9,000,000	.16	.16	.16	6.75	.32
Inhalation[b]				.61		.19
Dietary[c]						
H-3	430,000	1.44	1.44	1.44	1.44	1.44
Sr-90	.18			.94		
Ru-106	3.0	.02		.12	.18	.03
I-129	.06		1.26			
I-131[d]	.6		1.66			
Cs-134	1.2	.09		.07	.09	.02
Cs-137	0.6	.03		.06	.03	.01
		2.50	5.28	4.17	9.25	2.74

(a) Exposure normalized to 900 MT/yr; dose commitment in 50th year exposure at plant boundary.
(b) Dose from isotopes listed plus 25 Ci fission products (calculated as insoluble CE-144) and 0.25 Ci of transuranium isotopes.
(c) 30% of diet from local sources.
(d) 1 *l*/day milk intake by child.

(iii) Solid

The volume of solid wastes, other than high level wastes, from a model LWR annual fuel requirement is summarized in Table F-7. The undissolved fuel element hulls, containing trace quantities of uranium plutonium, and fission products, and other fuel element parts will be stored or buried on-site in recoverable form and may eventually be shipped to a Federal repository. Discarded equipment will be decontaminated prior to disposal. Laboratory wastes, small tools, gloves, and clothing may be buried on-site or at a commercial burial ground.

TABLE F-7

IRRADIATED FUEL REPROCESSING PLANT SOLID WASTES OTHER THAN HIGH LEVEL LAND BURIAL PER ANNUAL FUEL REQUIREMENT[45]

	Volume, cu. ft.
Undissolved fuel element hulls	350–700
Other fuel element parts and discarded equipment	140–230
Laboratory waste, small tools, gloves and clothing	190–1000

The solid wastes stored at NFS are stored in an essentially impermeable clay strata. At MFRP all solid wastes stored on site are stored in underground vaults equipped to detect, monitor and control water intrusion or leakage. At BNFP, solids will be kept in retrievable, sealed concrete drums stored underground.

(3) Thermal

The rate of heat dissipation from the model plant will be about 185 million Btu/hr. This is equivalent to 61 x 10^9 Btu per annual fuel requirement. The heat will be discharged to the atmosphere via the off-gas stack, a cooling tower and a cooling pond. All liquids released offsite will be cooled to ambient temperature prior to release.[46,47]

(4) High Level Wastes

High level liquid wastes containing more than 99.9% of the nonvolatile fission products are concentrated for storage on site in specially built, contained and monitored tanks for a maximum of 5 years. This is followed by conversion to inert solid and, after a maximum on-site storage time of ten years, eventual transfer to a Federally designated disposal site. At 150 days after discharge from the reactor, the activity of the irradiated fuel has decreased by radioactive decay to about 4 megacuries of fission products per MTU or 150 million curies per annual fuel requirement. In addition to the fission product content, there will be approximately 3.5 kilograms of plutonium and 350 kilograms of uranium in the wastes from an annual fuel requirement. The total quantity of high-level waste from an annual fuel requirement can be converted to a solid weighing approximately 1.4 to 2.3 MT.[48]

The MFRP plans on immediate solidification of high level wastes with no intermediate storage as liquid. The off-gases and particulate arising from this operation have been considered in the review of the MFRP.

(5) Man-rem Exposure from the Plants

Although tritium is released from two out of three of the plants comprising the model as a vapor, it can exchange with moisture, or condense and cause exposure when it is ingested as moisture or other tritiated compounds.

Using data in the Detailed Environmental Statements for MFRP and AGNS, and the EPA survey for NFS, the model fuel cycle facility is estimated to expose the population within a 50-mile radius to 167 man-rem most of which is from tritium ingestion.[49] This exposure is equivalent to 6 man-rem/year per annual fuel requirement.

(c) Accident Considerations[50]

At fuel reprocessing plants, operations having a potential for the occurrence of equipment failures or accidents which could disperse significant amounts of radioactive contaminants are performed within shielded process cells. These cells are designed to maintain adequate confinement capability in the event of accidents or natural phenomena much more severe than has been experienced historically for such plants or in the locality of the plant. It is expected that during the life of the plant, some equipment failures will occur. Accordingly, monitors are provided in the

system to detect process or equipment failures and to provide corrective action automatically, or signal a need for corrective action. Moreover, the plant is designed to cope with such failures or accidents, and the cells and equipment are designed so that they can be decontaminated for the repair or replacement of equipment. A ventilation system provides assurance that the contaminated air from within the cells, or from any inadvertent releases within the plant, will be routed through high efficiency filters that remove airborne radioactive particulate before the ventilation air is discharged to the stack. In summary, a fuel reprocessing plant is designed to (a) assure adequate margins of safety to prevent accidents, (b) cope with potential accidents, and (c) mitigate the consequences of accidents if they should occur as a result of multiple failures of systems or procedures that are intended to prevent accidents.

These plants are analyzed with respect to a wide spectrum of credible accidents and the consequence that might result if an accident should occur. While major equipment failures, or spills of radioactive materials within the plant, might disrupt operations and cause the plant to shutdown for cleanup and repair, it is not expected that such occurrences would result in the release of significant amounts of radioactivity so as to contaminate the offsite environs. That is, radioactive contamination would be confined within the process cell, or within the process building, and little if any might escape to contaminate the area in the vicinity of the plant, within the plant's exclusion area. Only a few accidents involving radioactive mate-

rials have occurred in existing plants, and none resulted in significant contamination beyond the immediate vicinity of the plant. The experience gained from these few accidents has resulted in improved safety procedures and features so that the probability of similar occurrences in the future is extremely low. Some examples of the types of accidents that might occur in fuel reprocessing plants, which would have little, if any, discernible impact on the off-site environs, are listed below. This is followed by a brief summary of the more significant potential accidents, irrespective of their low probability of occurrence, and an assessment of the possible consequences if they should occur as a result of multiple failures of systems or procedures that are intended to prevent their occurrence.

The following are examples of types of accidents that are postulated with respect to the analysis of irradiated fuel reprocessing operations. Those listed below are not expected to result in discernible contamination of the environs offsite, nor discernible exposure to the public.

Abnormal Event	Potential Consequence
• Drop fuel cask into cask unloading pool	Possible rupture of fuel pins and release of fission gas to atmosphere; contamination of storage pool water.
• Fuel element hung up in air during transfer to shear	Possible overheating and rupture of fuel pins; release of fission gas to atmosphere.
• Ignition of zirconium fires	Small fire of short duration — little, if any, damage.
• Rapid chemical reaction in dissolver	Vessel pressurized, seals blown, fission gases released to atmosphere; cell contaminated.

Abnormal Event	Potential Consequence
• Leak in recovered acid line	Contamination of cell or pipe trench in area of leak.
• Leak of any vessel or line confining radioactive material	Contamination of cell or pipe trench; transfer material to spare tank space, decontaminate cell and equipment, repair failure or replace equipment.
• Excessive entrainment radioactivity in evaporator overheads	Contamination of recovered acid or effluents, which must be recycled.
• Failure of an iodine scrubber	Reduced iodine removal efficiency of backup systems; shutdown plant until adequate efficiency restored.
• Filter failure	Detectable increase of radioactivity in stack effluent; shutdown plant and replace filter.
• Loss of ventilation zone control differential-pressure	Possible migration of radioactivity from controlled area to limited control area; correct deficiency and decontaminate building area.
• Solvent fire	May plug filter, contaminate cell and ventilation exhaust ducts; could require extensive cleanup of cell and ducts, and replacement of filter, while plant shutdown for repairs.
• Plutonium or waste concentrator explosion	Blowback of air, contamination of cell and possibly adjacent limited control area near cell; could require extensive cleanup of cell and adjacent building area, while plant shutdown for repairs; possible airborne particulate resulting in offsite exposures of less than 1 mrem.
• HF tank leak	Air concentration of toxic HF could be lethal to unprotected persons in vicinity of tank; not discernible offsite.

Table F-8 summarizes the possible consequences of the more significant potential accidents, if such accidents could occur, and is followed by a brief discussion of each accident. Even such major accidents, if they should occur, are not expected to result in radiological exposures that would have any discernible effect on the environment.

TABLE F-8

ESTIMATED RADIATION EXPOSURE AT SITE PERIMETER RESULTING FROM POSTULATED ACCIDENTS[51]

Accident	Organ of Greatest Exposure	Organ Dose (rem)
Criticality incident	Thyroid	0.04
Ion exchange resin fire	Lung	0.001
UF_6 loadout system leak	Bone	0.01
Storage pool cooler leak	Bone	0.01
Fuel assembly rupture	Thyroid	0.002

A criticality incident in a reprocessing plant is an unlikely event because the design of equipment and process limitations prevent such incidents. Safe spacing is ensured in storage basins by physically spacing the fuel elements in safe geometry even when dropped. Process systems and controls are designed to prevent assembly of an unsafe array. Nevertheless, a criticality accident is postulated, in which a burst of 10^{18} fissions is assumed. This yield is approximately an order of magnitude greater than that which has been experienced, on the average, in past accidents. It is further assumed that all noble gases and halogens (or halides) are discharged from the plant stack without taking credit for filters, and that the airborne fission products arrive at the site boundary 15 minutes after the burst. It is estimated that the whole body exposure from gamma radiation to an individual is approximately 3 mrem, and that the dose to the thyroid from radioiodine is 40 mrem.

Similarly, the design of equipment and process limitations prevent the occurrence and limit the consequences of a postulated ion exchange resin fire. However, in postulating a hypothetical ion exchange resin fire, it is assumed that 128 liters of resin, containing 30 gm of plutonium per liter, are contained in the column section that ruptures and burns. On the basis of known filter efficiencies and the results of burning experiments with metallic plutonium, it is estimated that approximately 10^{-5} of the plutonium, as insoluble plutonium oxide, passes the filter and is expelled through the stack. The resultant dose to the lung of an individual at the site boundary is estimated to be 1 mrem.

In a postulated UF_6 loadout system leak, 350 kg of UF_6 is assumed to escape as a result of a cylinder valve break at the loading temperature. The specific alpha activity of uranium in fuel irradiated to 33,000 MWd/T is approximately 1.4 Ci/kg. If it is assumed that the UF_6 bypasses the filter and is expelled as UO_2F_2 via the stack, the resultant dose to the bone of an individual at the site boundary is estimated to be approximately 12 mrem.

A leak in the storage pool cooler was postulated. The pool water activity is assumed to be approxi-

mately 5 x 10^{-3} μCi/ml. On the basis of Savannah River contaminant composition observations, Ce-144 is chosen to represent the potential hazard of the mixture of contaminants. It is assumed that 1.5 gal/min of cooling water is vaporized during the course of one week. Inspection programs assure detection within one week, and a higher rate of leakage would be detectable earlier. Assuming release outside the containment at ground level in the building wake, the estimated dose to the bone of an individual at the site boundary is approximately 10 mrem.

A fuel assembly rupture is postulated, in which all of the fuel pins in one element rupture under 20 feet of water in the fuel storage pool. One element contains about 0.45 MT of irradiated uranium. The rupture of all of the fuel pins in the element would release approximately one-third of the Kr-85 inventory and 3% of the iodine inventory, i.e., that which had diffused from the fuel into the void space in the fuel element. The gases in the void space would escape and bubble to the surface of the fuel storage pool. However, most of the iodine would be absorbed in the fuel storage pool water. On the basis that one-third of the Kr-85 and 0.1% of the iodine escape to the surface of the fuel storage pool and are exhausted to the atmosphere, the estimated exposure (primarily to the thyroid) of an individual at the site boundary is approximately 2 mrem.

The storage of high-level radioactive liquid wastes in stainless steel tanks within stainless steel lined vaults, with redundant cooling systems, multiple sources of cooling water supply, spare tanks, and

elaborate monitoring and alarm systems is deemed to represent a degree of containment as being essentially accident proof.[52] Moreover, these confinement systems are designed and constructed with a high degree of quality assurance to ensure their capability to withstand accidents, earthquake and tornado effects.[53] For these reasons, the probability of an accidental release of radioactivity is considered to be extremely low and thus there would not be any significant release to the environs.

(d) Contributions to the General Exposure

The reprocessing plants described in this chapter release all of the noble gases (predominantly Kr-85) and all of the available tritium present in the uranium dioxide fuel 150 days after shut down. A small fraction of the iodine isotopes, and small amounts of mixed fission products and actinides are also released. In the case of NFS, some part of the release is in a low level waste stream.

(i) Kr-85

The general exposure from Kr-85 may be assumed to come only from the isotope produced in reactor operation and released at the reprocessing plant. Using estimates for installed nuclear generating capacity, U.S. EPA estimates whole body annual exposure from Kr-85 in 1980 will be 0.003 mrem/person, compared to about 100 mrem/person from natural background.[54]

(ii) Tritium

Tritium is produced naturally by cosmic ray bombardment of oxygen and nitrogen and

arrives directly from outer space. The natural inventory of tritium is estimated at from 25-80 x 10^6 Ci. Weapons have produced another 1-2 x 10^9 Ci. The dose from tritium depends on the H-3 content of food and water. The U.S. EPA has estimated that the total tritium dose from all sources of tritium — weapons, natural, and reactors — will be 0.03 mrem/year per person in 1980. Reactor produced tritium will contribute about 2% of the total.[55]

Tritium emitted from the reprocessing plant can cause exposure in man by direct inhalation, drinking water, and the dietary food chain.

(iii) Iodine

The iodine isotopes are artificial; there is the well established pathway for human exposure of atmospheric discharge → deposition on grass → cattle → milk → man. Other pathways from deposition are possible, as well as the pathway from aqueous release → man. I-131 has an 8.05 day half-life so that accumulations in nature will not occur.

I-129 has a very long half-life, 17 million years; iodine is reported not to concentrate to any appreciable extent in its transfer from soil to plants and to have a possible reaction with soil organic matter to become largely unavailable. Garner therefore concludes that "It appears doubtful, therefor, that a reservoir of I-129 in the soil would pose a long-term problem."[56]

(iv) Other fission products

Isotopes of ruthenium, strongtium, cesion, cerium, and other fission products may be released from reprocessing plants in small amounts.

Data show that strontium uptake by man is decreasing at about 14%/yr, reflecting the removal effects of leaching, fixation, and removal by plants.[57]

Cesium is known to be firmly bound by clay materials in many soils, and in sandy soils fixation may be complete in about three years after contamination. The general conclusion is that Cs-137 in plant materials has arisen from direct contamination or entrapment of solid particles, although Cs-137 may be taken up from plants grown in organic soils.[58]

Other fission products released in small amounts include Zr/Nb, Ru, and Ce isotopes. Of these, Ru is reported to be slightly excluded (concentration ratio in plant/soil = 0.01-1) and Zr/Nb and Ce are strongly excluded (concentration ratio < 0.01).[59]

Radioisotopes such as strontium, cesium, and ruthenium can, however, reach man by dietary processes to cause exposure. (See Table F-6)

(v) Actinides

Plutonium and other actinides may be released in small amounts from the reprocessing plants. Experiments show that after deposition of particulate and initial stabilization, little or no resuspension of plutonium occurred except

from heavy gusts of winds or mechanical disturbance. Other studies show considerable vertical migration over a 10 year period.[60] Plutonium is strongly excluded by plants (concentration factor < 0.01).[61]

The Final Environmental Statement published by the U.S. AEC for the Midwest Fuel Recovery Plant considers the chronic deposition of I-129 and actinides for the time frame of the plant life in a more quantitative manner than is given above. The conclusion is that the radiological impact of deposited plutonium (used to characterize the actinides) is not expected to exceed that of radioactivity naturally present in the soil. The iodine-129 pool in the soil is expected to require 50 years build up before the dietary supply from this source would be comparable to the pasture-milk route. The MFRP Final Environmental Statement also concludes that the dose from deposited radionuclides in the soil is almost completely due to tritium. The tritium yields a mean average dose of 0.6 mrem over much of the area within a 50-mile radius of the plant.[62]

The annual exposure to the population within a 50-mile radius of the model reprocessing plant is estimated to be 167 man-rem, corresponding to 6 man-rem/annual fuel requirement. The average annual dose/person within the 50-mile radius is about 0.055 mrem/person.[63]

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G. *RADIOACTIVE WASTE MANAGEMENT*

1. *Summary*

(a) General

The radioactive wastes resulting from the nuclear fuel cycle can be categorized as high-level and other than high-level. High-level wastes, generated at fuel reprocessing plants, contain fission products separated from fissile material recovered from irradiated fuel. Other than high-level wastes result from operations involving production of UF_6, fuel fabrication, and fuel reprocessing. These include all wastes, regardless of concentration or specific activity, which are not designated as high-level.

Appendix F of AEC regulation 10 CFR 50 requires that the inventory of high-level liquid waste at the fuel reprocessing plant be limited to that produced in the prior 5 years and that it be converted to solid form and be transferred to a Federal repository within 10 years of its separation from the irradiated fuel. The establishment of a means for long-term storage or disposal of high-level wastes is under consideration. Starting about 1980 and until a long-term repository can be established, the Federal government plans to provide the Retrievable Surface Storage Facility (RSSF) as the interim repository for high-level wastes. This interim facility will be designed with capability for storage of wastes for a 100-year period. The Federal government will have responsibility for care and maintenance over the interim facility. Control must be maintained as long as any waste is stored in a facility.

Radioactive wastes other than high-level are buried in near-surface shallow trenches, usually in the containers in which they are shipped. There is no intent to recover the wastes once they are buried. There are 6 commercial land burial sites in the United States authorized to receive and bury other than high-level wastes.

Land used for commercial land burial is owned or controlled by the States. In the event of default or abandonment of the site by the commercial operator, the State is obligated to provide care and maintenance of the site to assure its dedication to radioactive waste burial and to assure it is not used for other purposes.[1]

(b) Environmental Considerations

(1) Resource Use

The waste generated as a result of fuel cycle operations will require the commitment of less than 0.2 acre for the storage of both high-level and other than high-level wastes resulting from the model LWR annual fuel requirement.

(2) Effluents

No effluents to the off-site environment are expected to result from burial of waste classified as "other than high level." Analyses of surrounding streams, test wells and vegetation are used to detect any migration which might lead to offsite contaminations. If any buildup is found, measures will be taken to determine the source and eliminate it.

Under normal conditions, there will be no radioactive or chemical effluents from the Re-

trievable Surface Storage Facility. Releases of radioactivity to air will be minimal, and are estimated to be of the order .005 curies/year.

(3) Accidents

Possible accident effects at commercial land burial facilities would normally be confined to low level contamination of the immediate area of the accident and would not result in release of significant amounts of radioactive material to the environment. However, if there were a release to areas outside the facility, the contaminated areas would be surveyed for radioactivity and decontaminated.

There are two types of accidents involving high level wastes which may be postulated at the RSSF. Catastrophic failure of the proposed water cooling system could result in the eventual meltdown of waste. It is estimated that more than one week would have to elapse without any corrective actions before any meltdown would occur. The safety features, and the number of sequential failures that would have to occur for total loss of cooling and the time period available for corrective action make this accident incredible.

A waste canister handling accident at the RSSF can be postulated which may result in discharge of radioactivity to the air. First year bone dose at the site perimeter is estimated at 0.1 rem.

(4) Contributions to the General Exposure

The low level burial grounds and high level RSSF are not expected to increase significantly the exposure of the general public.

2. *Description of the Radioactive Waste Management Industry*

Radioactive waste generated during fuel cycle operations is divided into two categories, high-level and other than high-level. High-level waste is defined in Appendix F, 10 CFR 50, as the aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels. All other solid waste, regardless of its source, falls into the other than high-level category and may be sent to a commercial land burial facility for disposal.

(a) Disposal of Other Than High-Level Wastes

At the present time, there are six commercial land burial facilities which are authorized to receive and bury other than high-level wastes. Five of the sites are on land owned by States and the other site is on land owned by the Federal government and leased to the State. Commercial land burial facilities must be located on land which is owned by either a State or Federal government.[3] The purpose of this requirement is to assure long-term control of the site in the event of default or abandonment of the site by the commercial operator. It is intended that, after radioactive wastes are buried at the site, the land not be used for any other purpose. The States have the obligation for perpetual care and maintenance of land burial sites to assure their dedication to waste burial and to assure that they are not used for other purposes. Authorization to operate a commercial land burial facility is based on an analysis of nature and location of potentially affected facilities and of the site

topographic, geographic, meteorological, and hydrological characteristics, and usage of ground and surface waters in the general area, which demonstrate that buried radioactive waste will not migrate from the site.[4]

Monitoring wells are maintained at most burial sites and are sampled periodically to determine if there has been any migration of radioactivity. In addition, air, water and vegetation samples are taken around the site and analyzed for radioactivity. Should any sample reveal an increase in the concentration of radioactive material in an aquifer above that measured prior to commencement of burial operations and it is determined that the radioactivity originated in the burial ground, its significance must be analyzed, corrective actions developed, as appropriate, and the entire matter reported. Corrective actions are subject to approval by the Atomic Energy Commission or an Agreement State and additional corrective measures may be required as a regulatory agency deems appropriate. An analysis by the U.S. Department of Interior Geological Survey of Sheffield, Illinois burial site predicts migration times through the undisturbed glacial sediment at the site of about 125-150 years, with an increased migration time for ionic material.[5]

To date, there have been no substantiated reports of migration of radioactivity from commercial burial sites. In the unlikely event that there would be such a finding, several courses of action could be taken. These include: (1) a halt to burial operations, (2) removal of the radioactive material from the burial area in which the radioactivity originated, (3) grouting of the site from which the radioactivity originated, or (4) other such procedures which might be necessary, depending on the extent of migration of radioactivity from the site.

Existing commercial land burial facilities are located in the States of Washington, Nevada, Illinois, Kentucky, South Carolina, and New York. The Illinois facility is licensed by the AEC; the remaining sites are licensed by the states. Currently, about 1,000,000 cubic feet of packaged radioactive waste materials are buried per year.[6] It has been estimated that the annual volume will increase to about 2,000,000 cubic feet by 1975 and 4,000,000 cubic feet by 1980.[7]

An average burial trench at a commercial burial site is about 300 feet long, 30 feet wide, and 20 feet deep and has a volume of 180,000 cubic feet.[8] The volume is not completely utilized since there are voids between packages and between packages and earth fill. Assuming 100,000 cubic feet of waste can be stored in a trench, approximately 10 trenches are needed per year to accommodate the current rate of burial of radioactive wastes. The total land area of the six burial sites is about 600 acres.[9] Assuming 50% usage of available land for trenches, this land area would accommodate over 1400 average burial trenches and would provide for burial of 140,000,000 cubic feet of packaged waste.

The commercial land burial sites are located in rural, sparsely settled areas or in virtually uninhabited areas such as the Armagosa Desert in Nevada.[10] The sites themselves are generally isolated so that public access to them is limited. The

areas in which wastes are buried are enclosed by fences and access to the sites is carefully controlled by the site operator.

The prime operations at a commercial land burial facility are the receipt, temporary storage, and burial in trenches of packaged radioactive wastes. The packages that are shipped to the burial facilities must meet the requirements of the Department of Transportation (DOT) and the Atomic Energy Commission (AEC) for transportation of radioactive material.[11]

The packages are normally buried as received with no reprocessing or repackaging of package contents. However, in some cases, the primary package containing the waste is shipped in a reusable overpack or secondary container which may be required by DOT regulations for shipment of the particular materials involved. In those instances, the primary package is removed from the reusable overpack before burial of the primary package.

The suitability of a site for burial of radioactive wastes depends on the geological and hydrological characteristics of a site and its ability to retain the radioactive material so that there will be no migration of the radioactive material from the burial site. No credit is taken for containment provided by the packages once they are buried. The purpose of the packages is to provide ease of handling and minimization of personnel exposure and to prevent loss of the radioactive material to the surroundings prior to burial.

The volume of packaged radioactive waste consigned to a commercial land burial facility by the

various steps in the fuel cycle is relatively small. There is no waste buried at commercial facilities from operations in the mining, milling, and enrichment steps. During production of UF_6, waste consisting of such things as rags, sweepings, boxes, piping, etc. contaminated with uranium is generated. The average concentration of the waste is low (a few thousandths of a microcurie per gram) and the volume of packaged waste sent to a commercial land burial facility for disposal amounts to a few thousand cubic feet for the model LWR annual fuel requirement.[12] Fuel fabrication operations generate wastes similar to those generated by UF_6 production facilities.

Fuel reprocessing operations generate wastes consisting of general laboratory waste, small tools, gloves, clothing, etc. contaminated with fission products and/or fissile materials.

The volume of waste generated as a result of reprocessing the spent fuel from a model LWR annual fuel requirement ranges from 200 to 1000 cubic feet, depending on the compaction or other volume reduction methods utilized at the fuel reprocessing facility.[13]

(b) High-Level Waste Disposal

Appendix F, 10 CFR 50, requires that the inventory of high-level liquid waste at a fuel reprocessing plant must be limited to that generated in the prior five years. The liquid waste must be converted to dry solids and transferred to a Federal repository no later than ten years following separation of fission products from irradiated fuels.

The solids will contain a variety of fission products and will ultimately be in a non-reactive form.

The spent fuel from a model LWR processed annually in a fuel reprocessing plant produces approximately 10,000 gallons of radioactive liquid waste which, when converted to a solid, weighs approximately 1.4 - 2.3 MT.[14] Assuming that this waste is in the form of calcined solids diluted with twice its volume of inert material, it would occupy a volume of approximately 70 cubic feet.

It was planned to construct a Federal repository in a salt mine for long-term geological storage of solid high-level wastes by the mid 1970's. However, subsequent events have deferred the site selection and construction of such a facility.

The present alternative plan is to design and construct a Retrievable Surface Storage Facility capable of safely storing high-level radioactive waste containers for 100 years or until such time as a permanent Federal repository can be established.[15] The Federal government will have responsibility for the care and maintenance for the RSSF which will be used for storage of high-level waste and the future repository for permanent storage of such waste. The intended life of the RSSF is 100 years; however, the Federal government will have the obligation for care and maintenance as long as any waste is stored in the facility.[16] Although a repository for long-term geologic storage of high-level waste is intended to isolate the waste from man and the biosphere, the Federal government will have the obligation to maintain control over the site in perpetuity.

3. *Description of Model Waste Handling Facilities*

(a) Land Burial Facility[17]

A model land burial facility for other than high-level wastes consists of 100 acres of land located in a rural, sparsely settled area. The site location is near a highway so that there is reasonable access to the site. The site characteristics are such that the ground water is well below the bottom of the deepest trench. The precipitation in the site area is on the order of a few inches per year up to 35-45 inches per year. In a trench in which rainwater could collect arrangements for pumping such water out of the trench are made. The soil provides good ion exchange characteristics to minimize percolation of radioactivity which may be leached from the solid waste to the groundwater. There is no nearby use of groundwater or well water downstream from the site. The site and its vicinity have the characteristically slow water movement through the soil in a direction in which there is little or no land use.

Buildings on the site provide space for offices, a laboratory, temporary storage of packaged radioactive wastes, and other waste handling as may be necessary, such as solidification of low concentration liquids. The storage space is also used for storage of vehicles, earth moving equipment, fork lifts, etc., which are necessary for preparation of trenches and handling of packages containing radioactive wastes.

The portion of the site in actual use is fenced so that access to trenches and buildings is prevented.

The fence also serves to minimize entry by area wildlife.

The operator of a site has a program for environmental monitoring. This program includes sampling of air, water, and vegetation to determine migration, if any, of radioactive material from the actual location of burial. Records are maintained of the monitoring results.

Trenches which are completed are cared for to minimize erosion and are marked to specify the contents. Packages in partially filled trenches are covered over with earth frequently to minimize access to the waste, provide shielding during placement of packages in the trench, and to minimize entry of water into the trench.

The model facility keeps temporary storage of packages to a minimum. Packages are placed in a trench and covered with earth as soon after receipt as possible.

(b) High-Level Waste Storage Facility[18]

In recognition of the need to take timely technical and budgetary steps to assure that facilities are available to accept the commercial high-level waste to be initially delivered in early eighties, the Commission, in the early spring of 1972, announced that it was proceeding on a program to design, construct and operate a surface (or near-surface) facility in which the solidified commercial high-level waste in sealed canisters will be stored. The facility and the canisters will be continuously monitored and maintained, and the canisters may be easily retrieved at any time if future technological

development offers equally safe alternate acceptable options having clear advantage over monitored maintained surface storage.

Since that time, engineering work on: (1) selection of the specific engineering procedures for receiving and handling sealed waste canisters; (2) heat removal, shielding, monitoring and maintenance of canisters and facilities; (3) conceptual design of facilities; (4) selection of site(s) for the facilities; (5) preliminary cost estimates; (6) preliminary analysis of safety under normal and abnormal conditions; and (7) operating and maintenance procedures, has proceeded with the objective that, while actual construction need not be initiated until 1979, all information needed to request Congressional authorization and initial funding for the first module of the repository will be available in time to allow the Commission, should it so desire, to include at least the initial phases of the project in its FY 1976 budget submission.

General Considerations

Any facility used to manage safely the high-level radioactive waste generated by the nuclear power industry must provide that the waste be contained in a way to assure that the radioactive material will not migrate to the environment and that penetrating radiation generated by the waste will not impact on man.

Provision for containment and radiation shielding for the relatively small volumes mentioned earlier would be easily achievable by simple containment were it not for the fact that radioactive decay re-

leases significant quantities of heat for significant time periods (for example, each one foot in diameter by 10 feet long canister may generate as much as 5KW of heat at the time it is received at the RSSF). Should adequate provisions not be made to remove this heat and transfer it to the natural heat sink of the atmosphere, the waste and the canister would melt. Thus, the major factor in the design of the RSSF for high-level waste is the technique used to remove the heat from the waste.

The Commission has carried out extensive evaluations of safety, reliability, operability, maintainability and economics of various methods for removing heat, and has essentially narrowed the area for further study to techniques using either water or air as the heat transfer medium. Water has been selected as the medium used in the reference design, but continuing study and evaluation is being made for the use of air as the coolant.

Reference Design

In the reference design concept, the incoming shipping casks, each containing a number of sealed canisters of waste, are removed from the rail car or truck on which they were transported from the reprocessor, and transferred into the shielded receiving area.

In this area, the shipping cask is opened and the waste canisters are removed for inspection and any necessary decontamination, repair, recanning or precooling.

Following any necessary pretreatment, the individually sealed waste canister is placed in a water

filled transfer cask and transported through a transfer corridor to a water cooled storage basin.

Figure G-1 shows the plan layout of the receiving cell and its relationship to the cask receiving area and transfer corridor. Figure G-2 shows the elevation layout of the receiving cell.

When the transfer cask arrives at the Storage cell, it is removed from its rail transporter and lowered with its contained canister into the water basin. The canister is removed, under water, from the cask and moved into its position in the water cooled storage cell. See Figures G-3 and G-4.

The storage portion of the facility consists of a series of basin modules, each designed to hold five hundred one foot in diameter by ten feet long waste canisters. Each basin has its own cooling system where water is circulated by a pump through a heat exchanger immediately adjacent to the basin. External cooling water is circulated through this heat exchanger where it picks up the heat and is then sent to a cooling tower where the heat is transferred to the outside air.

The total facility will be constructed in segments on a time schedule to meet deliveries from the reprocessors. The estimated number of annual shipments (assuming 12 waste cans per shipment) is as follows:

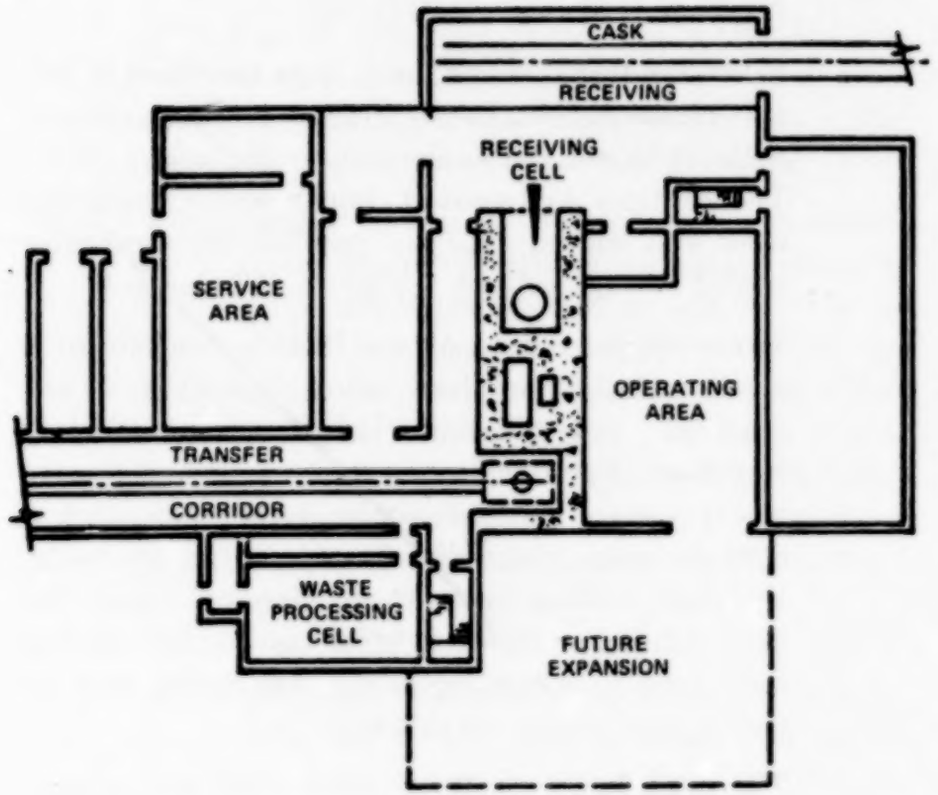

Figure G-1
REFERENCE DESIGN
RETRIEVABLE SURFACE STORAGE FACILITY
CANISTER RECEIVING AREA

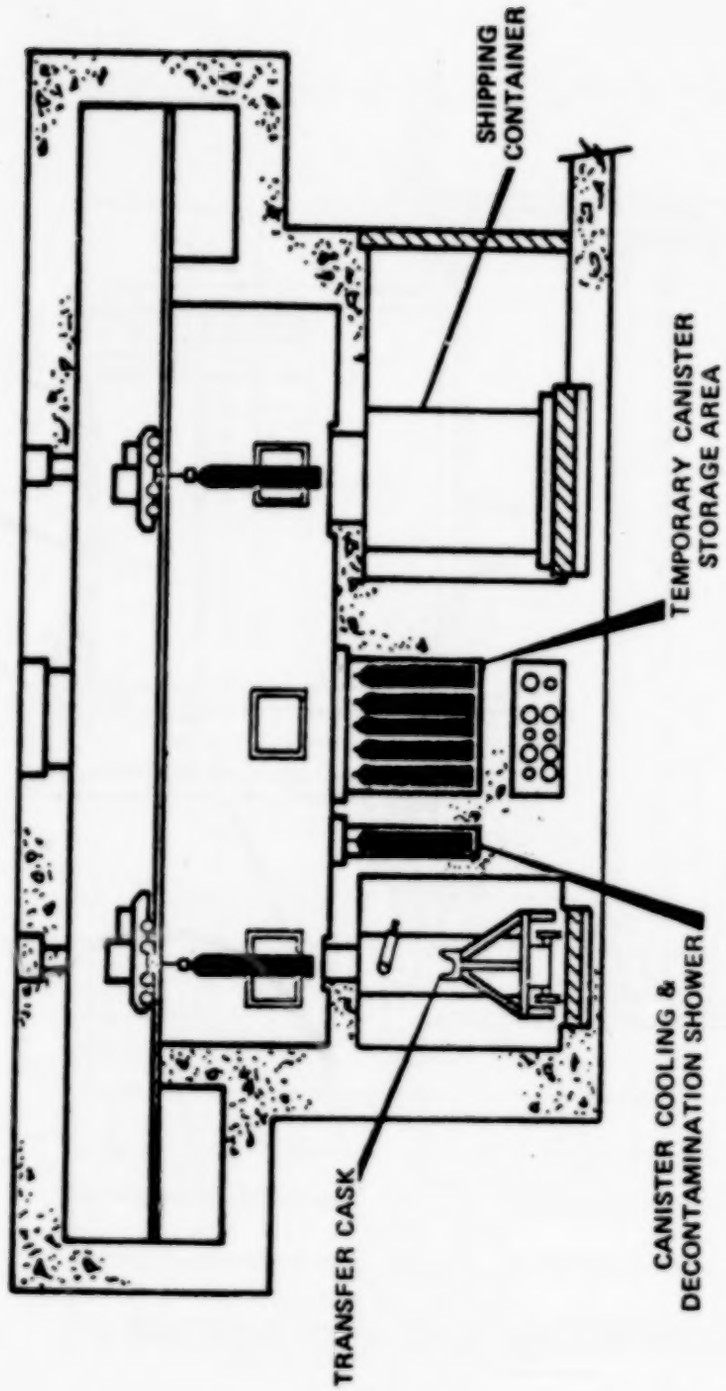

Figure G-2
REFERENCE DESIGN
RETRIEVABLE SURFACE STORAGE FACILITY
CANISTER RECEIVING CELL

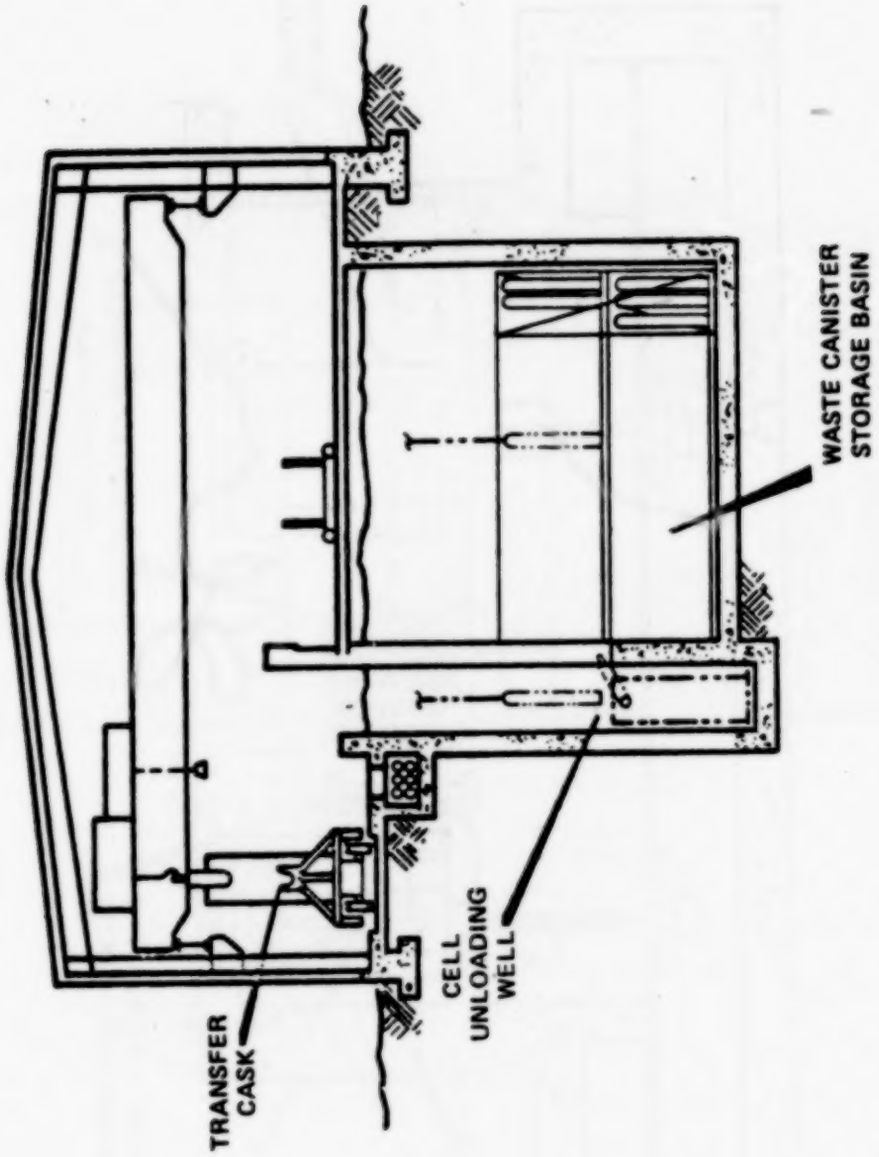

Figure G-3
REFERENCE DESIGN
RETRIEVABLE SURFACE STORAGE FACILITY
CANISTER STORAGE BASIN

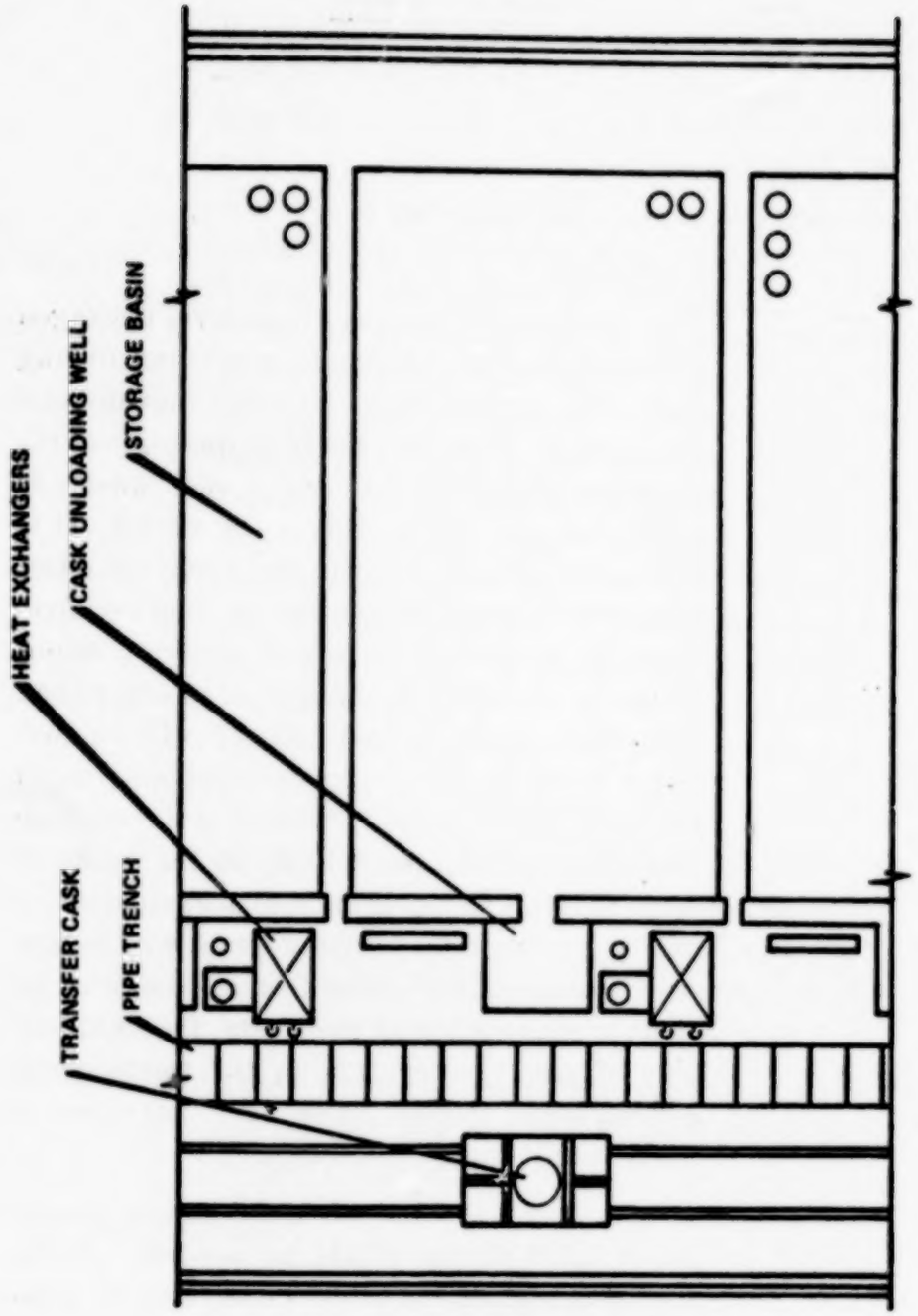

Figure G-4
REFERENCE DESIGN
RETRIEVABLE SURFACE STORAGE FACILITY
CANISTER STORAGE BASIN PLAN

Year	No. of Shipments Received at Repository
1985	20
1990	70

4. *Environmental Considerations*

(a) Use of Natural Resources

(1) Land Use

The volume of other than high-level packaged radioactive waste which is generated during fuel cycle operations is variable and difficult to estimate. However, the total quantity of radioactive material contained in such wastes is small and amounts to only a few curies. It is estimated that the nuclear fuel cycle activities required to produce the annual fuel requirement for a model LWR will generate about 10 curies of radioactive material in other than high-level wastes. This activity will be contained in wastes sent to commercial land burial facilities for disposal. Assuming an average concentration of radioactivity in the waste of 0.025 microcurie per gram and a waste density of 1 g/cc, the total waste volume will be approximately 14,000 cubic feet. Assuming no further compaction of the waste, the final volume of packages containing the waste could approximate 20,000 cubic feet per annual model LWR fuel requirement.

If the waste is packaged in 55-gallon drums, about 3,000 drums would be needed. If the drums are placed in rows 5 deep and 10 wide in an average 30 foot wide burial trench, 60 rows will be required. Since the drums are 2

feet in diameter, a total area of 3600 square feet of land surface will be required. This is less than 0.1 acre.

For the solid high-level waste which would be stored in a Retrievable Surface Storage Facility, it is estimated that the waste from the annual fuel requirement of a model LWR would be about 70 cubic feet and would be stored in 10 containers. It is estimated that about 4000 waste containers would be stored in the initial module of the engineered structure storage facility. About 0.1 acre of land is required for the interim storage of the annual high-level wastes from the model LWR fuel requirement. Based on the above estimates, the land area required for disposal of all radioactive wastes from manufacture and reprocessing of a model LWR annual fuel requirement is less than 0.2 acre.

(2) Water and Other Resources Use

There is very little use of water or other natural resources involved in normal operations involving the burial or storage of solid packaged wastes classified as other than high level generated as a result of fuel cycle operations.

Table G-1 summarizes the water and electrical energy use for the Federal High Level Waste Repository.

(b) Effluents

(1) Chemical and Radiological

The normal operations involved in the burial of "other than high level" radioactive wastes

in solid form are not expected to result in any effluent releases to the offsite environment.

Under normal operating conditions of the high-level waste repository, air releases will be minimal and produce air concentrations both on and off the site that are well below the recommended acceptable concentrations. The sources for occasional releases to the cell air would be material from: (1) receipt of contaminated casks; (2) decontamination of contaminated canisters; (3) repair or over packaging of failed canisters; and (4) miscellaneous clean-up operations around the storage basins. Since all exhaust air will be

Table G-1

SUMMARY OF RESOURCES USE FOR HIGH-LEVEL WASTE MANAGEMENT

	Full Facility	Normalized to an Annual Fuel Requirement of the Model 1000 MWe Reactor
Land Use (acres)		
Temporarily Committed	∿1000	∿0.1
Permanently Committed	∿100	∿0.01
Water Use (millions of gallons) (1)		
Evaporated	∿1000	∿0.13
Cooling Tower Blowdown	∿1000	∿0.13
Electrical Energy (MWH/yr) (2)	∿61 x 10^3	∿7.7
Solid Waste (Cu. Ft.)		
Nonradioactive	∿200/day	∿9
Radioactive	Max. 50/day	Max. 2

NOTES:

(1) Based on evaporation to remove heat plus an equal amount for blowdown.

(2) For pumping water.

filtered through three HEPA filters in series, these events are calculated to result in releases of radionuclides to the atmosphere in the range of 0.005 Ci/yr which is near the lower limit of detection. The maximum concentration of transuranics leaving the stack is estimated to be 1.0 x 10^{-12} μCi/cc while that of the fission products is 1.7 x 10^{-10} μCi/cc. For the public at the outer exclusion fence, dispersion, diffusion and dilution would reduce the estimated exposure to a very small fraction of the ICRP recommended maximum exposure.

No contaminated water will leave the facility. However, there may be occasional releases of small amounts of radioactive materials from leaking canisters in underwater storage to cell water. Such an event would be immediately detected by the continuous monitoring of the water in the storage basin. When such canister failure is detected by the basin monitor, procedures are put into effect to isolate the failed canister and remove it for repair or recanning. In the meantime, the basin water is circulated through an ion exchange decontamination system. The contaminated resin is then managed in accordance with its level of radioactivity.

(2) Thermal

Due to the very low concentrations of radioactive materials in the other than high-level wastes that result from nuclear fuel cycle operations, there is essentially no heat release to the environment from these wastes.

Canisters containing solid high-level wastes at the RSSF will generate a small amount of heat. The wastes in each canister (about 7 cubic feet) will generate about 2-5 kw of heat, depending on the elapsed time since the material was first created in the reactor. This heat will be dissipated to the atmosphere. During transfer and storage of canisters in the RSSF, some heat transfer medium will be used to dissipate the heat from the sealed canisters.

(c) Accident Effects

There have been no accidents at burial grounds under Federal or State jurisdictions that resulted in offsite environmental effects. Some minor accidents have occurred involving materials not utilized in any fuel cycle.

Accidental opening of an other than high-level waste package prior to burial and release of the package contents could occur, however, at a commercial land burial facility. Normally, the scattered waste materials would be confined to the fenced facility and the impact on the environment would be negligible. However, even if it is assumed that as much as ⅓ of the waste contained in a 55-gallon drum is released to the unrestricted area, the effect on the environment would be insignificant. The volume of a 55-gallon drum is approximately 2×10^5 cubic centimeters. Using the assumption made previously of a waste concentration of 0.025 microcurie per gram and density of 1 g/cc, the total amount of radioactivity involved is about 1.7 millicuries. If the waste were uniformly dispersed over an area of one acre, the

concentration of the radioactive material would be about 0.04 microcurie per square foot or 4×10^{-5} microcurie per square centimeter. Dispersion over a greater area would result in a proportionally lower concentration. Much of the dispersed material would be in the vicinity of the site which is normally uninhabited and unused. Recovery of the bulk of the scattered waste could easily be accomplished. Radiation surveys could be made and the area decontaminated.

For the high level waste repository, detailed safety analyses must be based on the specifics of design and of actual site location which are not now available.

Preliminary safety analyses have been made, based on conceptual design and on the assumption that standards for protection against the forces of man and nature used for other nuclear facilities such as reprocessing plants, etc., will apply.

A situation of considerable concern would be loss of ability to remove heat from the stored cans. This would result in melting of the canisters and waste and loss of some fraction of the isolation of the radioactive material from the environment.

The probability of this situation occurring is prevented by a combination of engineered features including, (i) redundancy of power supply and other essential cooling systems; (ii) structural strength to withstand credible forces of nature — earthquake, tornado, etc.; (iii) combination of structural strength, plant security, etc., to withstand credible overt forces of man; (iv) modular basin

cell construction which limits the number of canisters subject to a single castastrophic event.

Thus, before a meltdown could occur, it would be necessary to have a series of failures of systems which will be engineered, constructed, and operated for maximum reliability under rigorous quality assurance programs before a situation could occur where sufficient water could not be added to and maintained in the cell to keep it from leaking or boiling dry. The timing for such a series of failures to result in uncorrectable situations is important. The individual failure of power systems for circulating the coolant would not result in pool water boiling for at least 16 hours. Various corrective actions may be taken any time within a week which would prevent cell water from boiling away. After the complete loss of water, an additional day would be required before the waste would begin to melt. The number of sequential failures required of highly reliable systems, combined with the long time periods available for repair and recovery from each, result in the judgment that this is an incredible incident.

The maximum credible accident that can be conservatively postulated is assumed to take place during one of the various transfers of a single waste canister in air in the receiving cell. It is assumed that the canister is inadvertently dropped to the receiving cell floor. While the canisters are designed to be high integrity vessels and would probably not rupture it is postulated for this analysis that it will rupture, and that its entire contents will be suspended in the air of the receiving cell. The cell air, containing this full load of waste

material, then passes through two sets of HEPA filters. The effluent air from the filters is then assumed to contain 0.02 milligrams of waste per cubic meter of air discharged.[19] It is assumed that the waste is contained in one complete air change or 400 cubic meters. Using the values of 0.02 mg/m^3 and 400 m^3, a release to the environs of 0.008 grams of waste is postulated to have taken place. Dispersion calculations were made using a stack height of 28 meters, under stable conditions and a wind speed of 1 m/sec. The resultant exposure calculations are summarized below:

	At inner exclusion Area fence, 0.2 mile (operator)	At outer exclusion Fence 0.7 mile (public)
Estimated first year bone dose	0.15 rem	0.1 rem

These estimated exposures for operators and the general public are 30% and 20% of the ICRP recommended maximum dose.

(d) Contributions to the General Exposure

Naturally occurring members of the U-235 and U-238 decay chains and small amounts (< 10 Ci/AFR) of fission products and actinide elements may be buried as low level waste as a result of fuel cycle operations. Migration of radioactivity from the burial grounds is not anticipated.

The RSSF will contain fission products and actinides of various ages. Release of these mixed fission products and actinides to the environment is expected to be of the order of 5 millicurie/yr.

The low level burial grounds and high level waste disposal above ground facility are not expected to increase significantly the exposure of the general public — the increase is estimated at about 0.01% of background.

The presence of long-lived radiotoxic actinides in the high-level wastes has been the subject of extensive technical and non-technical articles.

The actinides present in high level wastes are diluted with inert material and with radioactive material of substantially shorter half-lives than, say, Pu 239. Weinberg has estimated that the concentration of Pu 239 in the high level waste is about 39 parts per million. After decay of most of the other radioactivity in the high level wastes, the hazard from the waste is comparable to that of pitchblende ore.[20]

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14. *Management of Commercial High-Level Radioactive Wastes,* p. 6.
15. Ibid., pp. 13, 16-17.
16. 10 CFR Part 50, Appendix F.
17. The model presented in this section is based on information in *Land Burial of Solid Radioactive Wastes.* Table 2, p. 33.
18. The model presented in this section is based on information in the statement of Dr. Frank K. Puttman, Director, Waste Management and Transportation, USAEC at the Hearings on the Uranium Fuel Cycle, February 1, 1973, Washington, D.C.
19. ORNL-4451, Siting of Fuel Reprocessing Plants and Waste Management Facilities, ORNL ed., (July 1970).
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OVERVIEW OF TOTAL NUCLEAR FUEL CYCLE

The preceding portions of this survey deal with the aspects of the uranium fuel cycle as related to an individual model LWR. To provide additional perspective on the environmental effects of the uranium fuel cycle, an overview of the combined effects from the total uranium fuel cycle industry has been estimated and is included in this section. Since the size and nature of the industry is dependent to a great extent upon the time frame of the evaluation, two time periods have been selected for this overview. The time frames utilized are as follows:

A. The date the survey was prepared (mid 1972); and

B. The end of this decade (1979-1980).

In order to evaluate the environmental effects of the uranium fuel cycle, it is first necessary to establish the size of the industry that it serves. In 1972, about 10-12,000 MWe of nuclear electric generation capability was estimated to be operational in the United States. The existing nuclear fuel cycle industry has capabilities that in general are in excess of the requirements for this size power generation capacity. Table O-1 summarizes the capabilities of the present day nuclear fuel cycle industry and relates these capabilities to the needs of today's power generation capacity.

Although other fuel cycle schemes are competing with the LWR concept, it appears that the prevalent method for generation of electrical power by nuclear energy will continue to be light water cooled and moderated uranium fueled reactors through the end of this decade. Several commercial size high temperature gas-cooled reactors (HTGR) have been committed and are planned to be operational by the end of this decade or the early part of the

next. It is estimated that this component of the nuclear power generation capability will be less than 5% (2-3%) of the nation's capacity by 1980. It is known that some utilities have plans to utilize bred plutonium in the form of mixed oxide LWR reload fuel in the latter part of the 1970's. Production facilities for this type of fuel are being planned and may be in operation during the latter half of the decades small amounts of this fuel could be available in the period 1976-1978. Production quantities of fuel could be expected to be manufactured by the end of the decade and as much as 5% of the total fuel in use by 1980 may be of the mixed oxide (Pu-U) variety. An additional concept for future application is the liquid metal fast breeder reactor (LMFBR). However, it is not expected that any significant application of this concept will be in commercial use by 1980. A commercial scale LMFBR demonstration unit is planned to be in operation early in the next decade. In summary, it appears that the nuclear generation of electric power for the remainder of this decade will be predominantly by the use of LWR's fueled with uranium dioxide and that this concept will constitute 90-95% of the industry throughout this period.

Numerous estimates of the size of the nuclear electric generation industry have been made and have required frequent revisions as a result of changing conditions and schedules. A consensus of these estimates indicate that approximately 140-150,000 MWe may be installed and on line by the year 1980. Based upon this projection, the requirements of the nuclear fuel cycle to service the power generation industry have been estimated and are shown in Table O-2.

TABLE O-1

NUCLEAR FUEL CYCLE INDUSTRY

1972

Type of Plant	Plant Average Annual Capacity Thousands of MT	Total Industry Annual Capacity Thousands of MT	Approx. Annual Demand from Nuclear Power Generation Thousands of MT	No. of Plants Available	Approximate No. of Plants Rqd to Meet Power Needs
Uranium Mines — Ore	250-750	8200	4500	220	10
Uranium Mills — U_3O_8	0.5-1.1	19	9	20	12
UF_6 Production — U	5-15	19	8	2	1+
Isotopic Enrichment — SWU	6	10	5	3	1
Fuel Fabrication — U	0.3-0.5	3	1.2	10	3+
Fuel Reprocessing — U	0.3	0.15*	0.2	2	1

*One plant in operation for about 6 months

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TABLE O-2

PROJECTED
NUCLEAR FUEL CYCLE INDUSTRY

1980

Type of Plant	Plant Size Thousands of MT	Annual Requirement Thousands of MT	No. of Average Plants Required to Meet Power Demands
Uranium Mines — Ore	250-750	17,000	30-40
Uranium Mills — U	0.5-1.1	34	40-50
UF_6 Production — U	5-15	34*	3 Low Enriched Plants & 3-4 Natural Plants
Isotopic Enrichment — SWU	7.5	20	3
Fuel Fabrication — U	0.3-1.8	5.3	8-10
Fuel Reprocessing — U	0.3-1.5	3	3-4

*Including recycle of recovered U from reprocessing operations Nuclear Power Generation Basis: 140-150,000 MWe

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Uranium Mining

1972

In 1972, domestic uranium mines produced about 6.3 million MT of ore per year having an average assay of about 0.2% U_3O_8. These mines have a total rate capacity of about 8.2 million MT per year. About 70% of the ore is mined in New Mexico and Wyoming with an additional 17% mined in Colorado and Utah. Only about 70% of the ore produced is required to meet the demands of today's nuclear power industry.

Over 98% of the uranium is produced by open pit and underground mining. About one-half of the total ore is produced in 29 open pit mines with individual capacities up to 700,000 MT per year and 193 underground mines with individual capacities up to 230,000 MT per year produce most of the remainder. The environmental considerations for an open pit mine producing 480,000 MT per year are listed in Table O-3.

1980

By the end of the decade, the nuclear electric generation industry will require the mining of about 17 million MT of uranium ore annually. The bulk of the known uranium reserves are in New Mexico, Wyoming, Texas, Colorado, and Utah. It is expected that mining methods will be similar to those used today except that a larger percentage of the ore may be mined using underground mining techniques since a large percentage of the known reserves occur at depths greater than 400 feet. The environmental effect of the uranium mining industry at the end of the decade may be represented by 30-40 mines similar to that shown in Table O-3. However, the average amount of land use per mine is expected to decrease as the percentage of ore mined by underground methods increases.

TABLE O-3

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR OPEN PIT URANIUM MINE — 480,000 MT/YR

Natural Resource Use	
Land (acres)	
Temporarily committed	290
Permanently committed	10
Overburden moved (millions of MT)	14
Water (millions of gallons)	
Discharged to ground	650
Fossil Fuel	
Electrical Energy (thousands of MW-hr)	1.3
Equivalent coal (thousands of MT)	0.5
Effluents	
Chemical (MT)	
Gases	
SO_x	45
NO_x	27
Hydrocarbons	1.6
CO	0.1

Uranium Milling

1972

In 1972, there were approximately 20 mills operational in the United States with a combined capacity of about 17,000 MT of U_3O_8 annually. Of these plants, 70% are within the output range of 500-1100 MT/yr. of U_3O_8. From Table O-1 it is indicated that 1972 nuclear power industry requires only 9,000 MT per year. Thus, it is apparent that approximately one-half of the 20 operational uranium mills would be adequate for that size power generation industry. These mills are located in sparsely populated areas in close proximity to mining operations principally in the States of New Mexico, Wyoming, Colorado, and Utah. The environmental

considerations from a 1000 MT/yr. U_3O_8 uranium milling industry may be characterized by 20 mills each having environmental effects similar to those noted in Table O-4.

1980

The nuclear electric generation industry by the end of this decade will require the operation of about 40-45 uranium mills. It is estimated that these facilities will employ technology very similar to that for 1972's plants with minor technological improvements which will tend to minimize some of the environmental considerations. Since the bulk of the known uranium reserves are centered in the far western States of New Mexico, Wyoming, Colorado, and Utah, it is expected that new milling facilities will be located in those areas near companion mining operations and in sparsely populated relatively arid regions. Thus, the uranium milling industry at the end of the present decade may be represented by 40-45 operating units, each having effects on the environment as listed in Table O-4.

UF_6 Production

1972

The nuclear generation industry requires about 8,000 MT of uranium as uranium hexafluoride (UF_6). The two facilities in operation at the present time have capacity considerably in excess of this level. It is probable that either existing plant could meet this demand without difficulty. Thus, to meet present day requirements, essentially only one UF_6 production plant is required. The environmental considerations for a 5000 MTU/yr. UF_6 production plant are summarized in Table O-5.

TABLE O-4

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS

URANIUM MILL — 1000 MT/Yr. U_3O_8

Natural Resource Use	
Land (acres)	
Temporarily committed	50
Permanently committed (limited use)	250
Water (millions of gallons/yr.)	
Discharged to air	360
Fossil Fuel	
Electric Energy (thousands of MW-hr/yr.)	15
Equivalent Coal (thousands of MT/yr.)	5.4
Natural gas (millions of scf/yr.)	380
Effluents	
Chemical	
Gases (MT/yr.)	
SO_x	485
NO_x (40% from natural gas use for process heat)	485
Hydrocarbons	7
CO	1.7
Liquids (thousands of MT/yr.)	
Tailing Solutions	1300
Solids (thousands of MT/yr.)	
Tailings	500
Radiological (curies/yr.)	
Gases (including airborne particulates)	
Rn-222	410
Ra-226	0.1
Th-230	0.1
U-natural	0.2
Liquids	
U & daughters	11
Solids	
U & daughters	6700
Thermal (millions of Btu/yr.)	390

TABLE O-5

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS URANIUM HEXAFLUORIDE PRODUCTION PLANT — 5000 MTU/Yr.

Natural Resource Use

Land (acres)	
Temporarily committed	1400
Permanently committed	10
Water (millions of gallons/yr.)	
Discharged to air	100
Discharged to water bodies	1100
Total	1200
Fossil Fuel	
Electrical Energy (thousands of MW-hr/yr.)	47
Equivalent Coal (thousands of MT/yr.)	17
Natural Gas (millions of scf/yr.)	550

Effluents

Chemical (MT/yr.)	
Gases	
SO_x	800
NO_x (25% from natural gas for process heat)	280
Hydrocarbons	17.6
CO	5.5
F	3.0
Liquid	
$SO_x^=$	124
NO_{-3}	3
F	243
Cl^-	6
$Na^+ + K^{++}$	93
$Nl+_3$	43
Fe	1.2
Solids	1000

Radiological (curies/yr.)	
Gases	
Uranium	0.004
Liquids	
Ra-226	0.0935
Th-230	0.04
Uranium	1.21
Solids (buried)	
Other high levels	24.
Thermal (billions of Btu/yr.)	500

1980

Plans are under way at the present time to initiate the recycle of uranium recovered from the fuel reprocessing step. It appears that each of the fuel reprocessing facilities may have a UF_6 production capability for recycle of recovered uranium values before the end of the decade. The requirements for UF_6 by the end of this decade are estimated to be approximately 34,000 MTU as UF_6. It is estimated that this requirement could be made up from the combined capacities of the planned UF_6 production facilities at the reprocessing plants amounting to 2700 MTU and facilities for production of UF_6 from natural uranium. This expanded demand could be met by the expansion of existing plants to double or triple their present capacity and additional new plants could be added so that a total of 3-4 facilities for the production of natural UF_6 could be operational by the end of the decade. At this time, no significant technological advances can be projected that will affect environmental considerations from these plants. Accordingly, it is projected that UF_6 production plants in 1980 will resemble in most respects the plants of today's era but may be about double their size. Therefore, the industry can be represented by a combination of about 3-4 natural ura-

nium hexafluoride plants, each twice the size of the unit summarized in Table O-5 and three smaller plants handling recovered slightly enriched uranium.

Isotopic Enrichment

1972

The nuclear generation industry in 1972 required about 5,000 MT of SWU to satisfy its present enrichment requirements. The industry is supplied with enrichment services from the complex of the three AEC owned and contractor operated gaseous diffusion plants. Essentially any one of the existing plants operated independently would be adequate to meet this demand. However, since all three installations are operated in a combined fashion, it is difficult to isolate the environmental considerations of an individual plant. Accordingly, the environmental effects of the total three-unit complex as it is operating today are summarized in Table O-6.

1980

It is planned to increase the capability of the existing three-plant complex from about 10,000 MT SWU to 22-27,000 MT SWU. This increased capability will be achieved without the construction of major new gaseous diffusion facilities and will be accomplished primarily by improving and upgrading present units. The modifications will involve installation of improved equipment and increased utilization of electrical power. Thus, no new processing plants are required to meet the projected 1980 industry demands and accordingly the land requirement for this portion of the fuel cycle will remain essentially constant to the end of the decade. It should be noted that the utilities providing power to the gaseous diffusion complex have made commitments for the installation of significant amounts of additional power generation capacity. Included in these commitments are major nuclear generation stations amounting to 8-10,000 MWe of capacity. It is estimated that this switch over from essentially all coal burning power plants to some

TABLE O-6

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR URANIUM ENRICHMENT COMPLEX

Natural Resource Use	1972 10,500 MT SWU	1980 18,000 MT SWU
Land (acres)		
Temporarily committed	1500	1500
Permanently committed	nil	nil
Water (millions of gallons/yr)		
Discharged to air	8100	12,000
Discharged to water bodies*	10^6	1.8×10^6***
Fossil Fuel		
Electrical Energy (thousands of MW-hr/yr)	28,500	41,000
Equivalent Coal (thousands of MT)	10,000	10,000***
Effluents		
Chemical (MT/yr.)		
Gases		
SO_x	400,000	400,000
NO_x	100,000	100,000
Hydrocarbons	1000	1000
CO	2500	2500
Particulates	100,000	100,000
F	45	45
Liquids		
Ca+	490	880
Cl	740	1130
Na+	740	1130
$SO_4^=$	490	880
Fe	36	65
NO_3	240	450
Radiological (curies/yr.)		
Gases		
Uranium	0.2	0.3
Liquids		
Uranium	1.8	3.1
Thermal (billions of Btu/yr)	290,000	420,000

*power plant cooling

**67% at power plants

***about ⅓ of electrical power from nuclear stations in 1980.

nuclear powered stations could effectively result in about one-third of the power requirements for the gaseous diffusion complex being provided by nuclear generation facilities. The industry demand in 1980 will require operation of the gaseous diffusion complex at a level of 20,000 MT SWU. Assuming that the plants will be modified to incorporate current improved technology, this level of operation will require approximately 7,400 MW of electrical power. On the basis that two-thirds of the power for this operation could be provided by coal burning power stations, the amount of power supplied by coal fired stations in 1980 will amount to 3,200 MW which is about constant with today's situation. Thus, despite the fact that the separative work capability of the complex will be increased by about 70% and its power rating will be upgraded by about 50%, the major gaseous chemical effluents, which come from the combustion of coal, attributable to the isotopic enrichment function may remain constant with today's levels. The use of natural resources such as water (assuming once through cooling at the power plants) and liquid chemical and all radiological effluents might be expected to increase at a rate essentially equivalent to the increased separative work capability. A summary of the environmental considerations of the enrichment complex in 1980 is listed in Table O-6.

Fuel Fabrication

1972

The fuel requirements for the 1972 nuclear generation industry were approximately 1200 MTU. This capacity was met by 10 existing plants, a number of which have limited capacity and which conduct only a portion of the processes required to produce fuel assemblies for reactors. In fact, only two of the facilities that were in operation in 1972 are large scale production plants which have capacities similar to that considered for the model plant in this statement. The environmental considerations for a 900 MTU fuel fabrication plant are summarized in Table O-7.

TABLE O-7

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR 900 MTU/Yr. FUEL FABRICATION PLANT

Natural Resource Use	
Land (acres)	
Temporarily committed	100
Permanently committed	nil
Water (millions of gallons)	
Discharged to water	135
Fossil Fuel	
Electrical Energy (thousands of MW-hr.)	44
Equivalent Coal (thousands of MT)	16
Natural Gas (millions of scf)	94
Effluents	
Chemical (MT)	
Gases	
SO_x	600
NO_x	160
Hydrocarbons	1.6
CO	4
F	0.1
Liquids	
N as NH_3	220
N as NO_3	140
F	106
Solids	
CaF_2	680
Radiological (curies)	
Gases	
Uranium	0.005
Liquids	
Uranium	0.5
Th-234	0.3
Solids (buried)	
Uranium	6.0
Thermal (billions of Btu)	230

1980

Plans are under development for the expansion of the existing production facilities and for the design and construction of numerous new production type fuel fabrication facilities to replace some of the smaller units now in operation. It is estimated that by the end of the decade, 8-10 production facilities could be in operation to meet the annual requirements of over 5,000 MTU of fuel per year. In the case of fuel fabrication, technological advances have been under development for several years which could have a significant effect on environmental effects. The development of a dry process for conversion of UF_6 to UO_2 has been in progress for some time and it is anticipated that this technique will be used by the end of the decade, substantially reducing both gaseous and liquid chemical effluents that are associated with process operations. This process improvement will essentially eliminate the chemical effluents of ammonia and fluoride. Thus, this industry can be characterized in 1980 by 8-10 plants similar to the one summarized in Table O-7 with the elimination of most of the process chemical effluents.

Fuel Reprocessing

1972

One plant for the reprocessing of commercial nuclear power reactor fuel has been in operation for about six years. This plant is currently shut down for extensive modifications and has operated for only a portion of 1972. A second plant is nearing the operational stage and is planned to be handling irradiated fuel during 1973. An additional plant is under construction for operation by the middle of the decade. As noted in Table O-1 there is little demand for reprocessing services at the present time. Much of that demand has been met by the one plant operating for part

of a year and storage of fuel at that plant planned to be operational in 1973. The environmental effects of the model 900 MTU/yr. reprocessing plant are shown in Table O-8.

1980

It is estimated that three fuel reprocessing plants may be operational before the end of the decade with a combined capability of processing 2,700 MTU annually. A fourth plant is being planned for start-up late in this decade or early in the 1980's. It appears that these plants would be adequate to meet the power industry needs. Thus, the industry in 1980 can be characterized by 3-4 plants similar to the plant outlined in Table O-8.

TABLE O-8

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS OF 900 MTU/YR FUEL REPROCESSING PLANT

Natural Resource Use	
Land (acres)	
Temporarily committed	2000
Permanently committed	100
Water (millions of gallons)	
Discharged to air	100
Discharged to water	150
Fossil Fuel	
Electrical Energy (thousands of MW-hr.)	12
Equivalent Coal (thousands of MT)	4
Effluents	
Chemical (MT)	
Gases	
SO_x	160
NO_x	185
Hydrocarbons	0.5
CO	1
F	14

Liquids	
Na^+	140
Cl^-	0.5
$SO_4^=$	14
NO_3 (as N)	5
Radiological (curies)	
Gases (including entrainment)	
Tritium (thousands)	430
Kr-85 (thousands)	9000
I-129	0.06
I-131	0.6
Fission products	26
Transuranics	0.10
Liquids	
Tritium (thousands)	65
Ru-106	4
Cs	2
Sr-90	0.100
Thermal (billions of Btu)	1600

Waste Management

1972

In 1972, there were six commercial land burial sites in operation in the United States with a total area of approximately 600 acres. Not all of this land is available for actual burial of wastes since some of the land area is needed for support facilities, pre-burial storage, etc. The land available for waste burial is adequate for the amount of radioactive waste generated by fuel cycle industries in 1972, about 1.0-1.5 acres annually. At the present time, there is no requirement for a Federal storage facility for long-term storage of solidified high-level wastes generated as a result of fuel reprocessing operations.

1980

By 1980, it is estimated that the nuclear electric generation capacity will increase to about 12 times present capacity. On this basis, about 12 to 18 acres will be needed for burial of radioactive waste generated by fuel cycle facilities. This would be well within the capacity of the currently existing commercial land burial sites and it does not appear that additional sites would be required. By 1980, it is anticipated that a Retrievable Surface Storage Facility (RSSF) will be under construction for storage of solidified high-level wastes. The high-level wastes, in a combination of liquid and solid forms, could be stored at the fuel reprocessing facilities without significant environmental effects until the RSSF is completed and available for storage of wastes during the next decade.

Transportation

1972

The nuclear power generation industry amounted to 10-12 annual operating units. The transportation needs of the supporting fuel cycle are shown in Table O-9. The movement of low specific activity material constitutes almost all of these shipments. The heat and weight in any shipment and the relatively small number of shipments will essentially have no appreciable effect on the environment. The estimated population exposure for onlookers, people along the route and transportation workers is 4.2 man-rem.

1980

By the end of the decade the size of individual plants may increase and certainly the number of plants will greatly increase. As production levels increase at a particular site, the transportation requirements may favor switching from truck to rail shipment. Typical of this change might be the

TABLE O-9

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR TOTAL NUMBER OF PACKAGES TRANSPORTED ANNUALLY

Step-Material Transported	1972 Total No. of Truck Shipments	1980 Total No. of Truck Shipments
1. Mine to Mill — Ore	40,000	500,000*
2. Mill to UF_6 Production —	140	1,800**
3. UF_6 Production to Enrichment — Natural UF_6	260	3,300**
4. Enrichment to UO_2 Plant — Enriched UF_6	60	750**
5. UO_2 Plant to Fabrication — Enriched UO_2	180	1,400**
6. Low level waste to Commercial Land Burial Sites	700	8,700
7. Solid Wastes to Federal Storage — Fission Products	12(Rail)***	150(Rail)***

*Almost all of these shipments are made on privately owned land.

**Number of shipments may be reduced by shipments from larger processes being switched from truck to larger rail shipments.

***These packages, one (1) per shipment, will be stored at the reprocessing site until after 1980 when the Federal storage and repository facilities are planned for use.

shipment of natural UF_6 in cylinders from the UF_6 production plant to the gaseous diffusion plant.

Despite the fact that the mass handled in transportation should increase by a factor of about 12-15, the quantities involved will continue to be of little consequence with regard to the total transportation industry. A summary of the shipments is shown in Table O-9. The estimated popu-

lation exposure is 53 man-rem. It is assumed that this 53 man-rem exposure will be distributed among at least 600,000 people giving an average exposure of 0.09 mrem/person/year. The dose due to the average natural background radiation is about 100 mrem/person/year.

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FEBRUARY 6, 1972

UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

BEFORE

THE ATOMIC SAFETY AND LICENSING BOARD

In The Matter of: CONSUMERS POWER COMPANY MIDLAND PLANT UNITS 1 AND 2	Docket No. 50-329 50-330

SAGINAW VALLEY ET AL. INTERVENORS' STATEMENT OF ENVIRONMENTAL CONTENTIONS

INTRODUCTION

Pursuant to the Order of the Atomic Safety and Licensing Board ("Board"), Intervenors herewith submit their Statement of Environmental Contentions. Intervenors reserve the right to amend this Statement of Contentions, from time to time, as regarding environmental matters relating to the construction of the proposed Midland Units (hereafter referred to as the "proposed Plant" or "Plant").

Notwithstanding the Atomic Energy Commission's or this Board's rulings to the contrary, Intervenors assert that the Atomic Energy Act and the National Environmental Policy Act affirmatively require the Regulatory Staff of the Atomic Energy Commission and this Board, on their own motion, to consider all matters of environmental significance, whether or not such matters are brought to the

attention of the board by the Intervenors. Accordingly, it is our position that the Board must make its own searching inquiry into the validity of the Environmental Statement prepared by the Regulatory Staff, the correctness and scope of Applicants' Environmental Submissions and any other environmental matter which would reasonably come to the attention of an objective and reasonable hearing board. It is for this reason, as well as for the reasons that the Intervenors have been denied access to reasonable discovery in aid of their Statement of Contentions and that all environmental submissions thus far by the Regulatory Staff and the Applicant have failed to discuss all sides of a particular environmental issue (thereby failing to provide to Intervenors sufficient information upon which to base their Contentions) that Intervenors believe that they are entitled to raise as Contentions hereafter any matter which could reasonably be placed before the Board at any time prior to the conclusion of the evidentiary hearing on environmental matters.

Attached hereto as Exhibit A is a preliminary request for certain discovery in connection with this Statement of Contentions. Intervenors, do not, as has been pointed out before, believe it is fair or judicially sound to require discovery to be finalized prior to rulings by the Board as to the scope of environmental inquiry. Moreover, as shall be set forth below, because the submissions of the Regulatory Staff and the Applicant are deficient, not only because they fail fully to discuss issues raised, but also because they fail to discuss at all significant environmental issues, the requirement to finalize discovery at this time is contrary to traditional notions of fair play and justice. Accordingly, Intervenors reserve the right to make their further request for discovery at a point in time when the scope of environmental inquiry has been validly defined by the Board.

I

ENVIRONMENTAL CONTENTIONS RELATING TO THE INADEQUACIES OF THERMAL DISSIPATION DURING NORMAL OPERATION OF THE PLANT

1. Based upon objective engineering data, the cooling pond is of a size insufficient adequately to cool the water dissipated from the Plant during normal operations so as to prevent adverse thermal loading of the Tittabawassee River (hereafter "River"). Adverse thermal loading will impair any proposed plans to revitalize the River. Moreover, adverse thermal loading will lead to further degradation of the River and have at least the following undesirable environmental effects:

   (a) Decreased dissolved oxygen content;

   (b) Fish kills;

   (c) Reduction in benthic organisms;

   (d) Reduction in zooplankton;

   (e) Increase in undesirable phytoplankton;

   (f) Reduction in assimilative capacity for waste water treatment plant effluents;

   (g) Degradation of the quality of waters into which the River flows, including the Saginaw River and Lake Huron;

   (h) Increased undesirable burdens on municipal water treatment plants situated downstream.

2. Because of the meteorological conditions occurring at various times of the year in the geographical vicinities of the Plant, it is improbable, and, therefore, there exists no reasonable assurance, that sufficient make-up water for the cooling pond will be available.

These meteorological conditions include inadequate rainfall, insufficient ground water, low relative humidity, sustained, high wind velocities, and sustained lack of cloud cover leading to increased solar input. As a result of these conditions, and the lack of available make-up water from sources other than the River, cooling facilities will result in higher thermal loading than contemplated in (1) above, aggravating the adverse environmental effects set forth in (1) above.

3. If sufficient make-up water is unavailable from the River and, therefore, as asserted, no discharges are made from the cooling pond to the River, the efficiency of the Plant will be reduced (and on certain conditions available power from the Plant may be drastically reduced or limited) thereby adversely affecting users of electricity in the relevant franchise area who may, from time to time, rely upon the Plant for a dependable source of electricity. These conditions are further aggravated by the fact that as pond water drawdown occurs, the available surface water area for cooling decreases.

4. During periods of insufficient make-up water, undesirable amounts of blue-green algae will proliferate in the cooling pond because of the high thermal content. These undesirable blue-green algae will cause obnoxious odors and adversely affect the health and life of aquatic and terrestrial organisms which will rely upon the cooling pond as a source of food and water. Applicants have suggested that they will control undesirable increases of blue-green algae with the use of massive amounts of chlorine or other undesirable and dangerous chemicals; however, use of chlorine and other undesirable and dangerous chemi-

cals will also have an adverse effect upon the health and life of aquatic and terrestrial organisms which will use the cooling pond as a source of food and water.

5. Operation of the cooling facilities will result in undesirable fogging during certain parts of the year. Fogging will occur during periods when there is a significant difference between the ambient air temperature and the temperature of the cooling pond water. Fogging will be further increased during periods of such difference when there also exists average to high relative humidity. Under conditions conducive to fog, fog will be increased when there exists insufficient make-up water for the cooling pond. Fogging will cause at least the following undesirable environmental effects:

   (a) Decreased visibility on adjacent highways and roads, resulting in hazardous conditions;

   (b) Increase and directly cause icing on adjacent highways and roads during periods when the ambient air temperature is below 0° Centigrade, resulting in hazardous conditions;

   (c) Decreased visibility in the Midland Community, resulting in hazardous conditions;

   (d) Increase and directly cause icing in the Midland Community during periods when the ambient air temperature is below 0° Centigrade, resulting in hazardous conditions;

   (e) Decreased visibility in Dow Chemical and Dow Corning facilities, resulting in hazardous conditions;

   (f) Increase and directly cause icing in Dow Chemical and Dow Corning facilities during periods when the ambient air temperature is below 0° Centigrade, resulting in hazardous conditions, production outages, and dangerous conditions considering the types of raw materials and products used and produced at such facilities;

   (g) Destruction of plant life due to icing;

   (h) Destruction of wild birds due to icing;

   (i) Impair the efficiency of or break elevated objects, such as poles, wires, towers, and transmission lines.

6. Regardless of the inadequacies of the size of the cooling pond, Applicant will be increasing, by operation of the Plant, the total dissolvable solids in the cooling pond and in the River. Although Applicant asserts that by the time of proposed operation of the Plant the level of total dissolvable solids existing in the River will be decreased, so as to permit an incremental increase as a result of the operation of the Plant, Applicant and the Regulatory Staff have failed to state how this will be accomplished. Increase in total dissolvable solids will cause turbidity on the River and cause various adverse effects, depending upon the nature of the total dissolvable solids, including but not limited to those set forth in (1) above.

7. Under certain conditions, Dow Chemical has contractually agreed to supply make-up water to the Plant. There is no discussion concerning where Dow Chemical will secure the make-up water, whether Dow Chemical will be able to supply the make-up water, whether such supply of make-up water by Dow Chemical will adversely affect the amount of water Dow Chemical itself may need for safe operations of the Dow Chemical and Dow Corning facilities, or whether such sup-

ply of make-up water will adversely affect the supply of water to the greater Tri-City area for drinking purposes, or affect the supply of water as a source of food and water to aquatic and terrestrial organisms within the affected geographic area.

II

DISCHARGE OF CHEMICAL WASTES

8. Applicant plans to discharge chemicals on a regular basis, during operation of the Plant, into the River and Bullock Creek.

9. Dow Chemical already discharges chemicals into the River and Applicant's discharges will have an additive and incremental adverse effect upon the life and quality of the River water, the organisms contained therein, the organisms which rely upon it as a source of food and water, and the ability to revitalize the River. The adverse effects will vary in severity depending upon the character of the chemical.

10. Bullock Creek is an intermittent stream. During periods of the year when Bullock Creek is dry or nearly dry, Applicant's hot chemical discharge will be the only source of water in Bullock Creek. Since the discharges will be at least as high as temperatures from from 80 to 125 degrees Fahrenheit, the severity of adverse effect during such dry periods will be increased.

11. Since Bullock Creek is a tributary to the River, any discharges into Bullock Creek are, in effect, discharges into the River, as well. There is, therefore, an insufficient analysis and discussion of the adverse effects of such discharges.

12. There is a failure to consider and analyze what adverse effects discharges into the Bullock Creek and the River will have upon other bodies of water into which the River runs, such as the Saginaw River and Lake Huron.

13. Since it is possible to remove chemicals by treatment prior to discharge into the Bullock Creek and the River, Applicant's proposed discharges represent an unwarranted cost to the environment. Applicants have not discussed methods of removal, such as the installation of a waste treatment system at the Plant itself or some method of using treatment facilities available at Dow Chemical and Dow Corning.

III

NON-RADIOACTIVE SOLID WASTES

14. There is no discussion of the quantity or character of non-radioactive solid wastes which will be regularly discharged during normal operation of the Plant. Depending upon the method of disposal, there may be adverse environmental effects from such wastes.

15. There is a falure to discuss what relationship, if any, will result between non-radioactive solid wastes created by the Plant and non-radioactive solid wastes normally disposed of by Dow Chemical and Dow Corning. For example, there is no discussion whether such wastes will be used as landfill, what the organic and inorganic composition of the wastes might be, and what effect, if any, such wastes and by-products may have upon the surrounding area, including ground water.

IV

SANITARY WASTES

16. Sanitary waste products created by operation of the Plant are planned to be shipped to Dow Chemical or Dow Corning facilities for treatment or disposal. There is no explanation, discussion, or description of the manner by which such sanitary wastes will be shipped to Dow or the manner by which Dow will dispose of such wastes. Thus, a complete analysis of the effect of sanitary wastes of the Plant must include an analysis of Dow Chemical and Dow Corning sanitary waste systems. Without such a discussion, relative cost-benefit and risk-benefit analyses cannot be made.

V

ENVIRONMENTAL EFFECTS ABSOLUTELY AND INCREMENTALLY, OF THE URANIUM FUEL CYCLE

17. Environmental submissions by Applicant and Regulatory Staff have failed completely to discuss or analyze the absolute and incremental effects upon the environment (including cost-benefit and risk-benefit considerations) of the entire uranium fuel cycle, including the production of uranium by means and methods not presently developed, such as, for example, the Liquid Fast Metal Breeder Reactor ("Breeder"). A great deal is presently unknown by the Atomic Energy Commission, and vendors and utilities in the nuclear industry concerning the effects of an increased surge in nuclear development and use of uranium upon the environment. Below in this section, we set forth considerations known to us at this point, which

must be the subject of an environmental analysis, and without which, a full and complete analysis cannot be made.

18. The Plant will cause, absolutely and incrementally, environmental damage and adverse effects, known to man, from the mining of the uranium, which will be necessary in order to supply fuel for the Plant. It is contended that strip-mining of uranium necessary for fuel for the Plant will without adequate benefits, represent an unwarranted environmental cost to the environment. Additionally, uranium tailings will be produced as a by-product as a result of strip-mining or any other mining of uranium. The disposition of such tailings and its effect upon man and his environment have not been considered. Moreover, during the mining of uranium, many radionuclides are produced such as, for example, radon. These radionuclides are lethal or sub-lethal; and, thus, contribute to the death of man and other organisms and will contribute to long-term contamination of particular geographic areas, making them essentially useless for any alternative purpose. Thus, we contend that this segment of the uranium fuel cycle must not only be discussed in depth, but must also be quantified in any cost-benefit consideration to determine whether the resultant costs and risks (which are incrementally and absolutely created as a result of the proposed Plant) are outweighed by any alleged or asserted benefits.

19. After uranium is mined, the ore must be shipped for milling and processing into yellow cake as the next step in the production of nuclear fuel. Once again, there is absolutely no discussion or consideration of this segment of the fuel cycle, what adverse environmental effects may occur, and whether the costs and

risks are outweighed by alleged or asserted benefits. After uranium is fabricated into yellow cake, it must be further processed into a form of ceramic pellet, which pellets ultimately become a part of the nuclear fuel rod itself (Uranium 235 and Uranium 238). Thereafter, the fuel rods are distributed for use in nuclear power plants and for use in the proposed Plant. There is no discussion of the consequences or adverse effects associated with the reprocessing of yellow cake ultimately into fuel rods, nor is there any discussion or analysis of the costs and risks associated therewith, and whether they are outweighed by any asserted or alleged benefits.

20. Subsequent to the use of fuel rods at the proposed Plant, high and low level radioactive waste products will be generated. High level radioactive wastes from irradiated fuel will be transferred, presumably to a reprocessing center, for separation of plutonium and uranium. Uranium 235, uranium 238, and plutonium presumably will be used once again to create nuclear fuel. However, the major portion of the high level radioactive wastes, which are not uranium or plutonium, then must be disposed of and stored for substantial periods of time. There is no discussion at all of where such high level radioactive wastes will be stored and what incremental burden will be placed upon storage facilities and their surrounding environment as a result of high level radioactive wastes from the proposed Plant. Indeed, the Atomic Energy Commission has, at present, no site selected for the disposition of such high level wastes; and, therefore, as a matter of law, there has not been any cost-benefit or risk-benefit analyses of the disposition of such high-level wastes with respect to asserted or alleged benefits. Intervenors contend that the disposal of such high level radioactive wastes create risks and costs to the environment and result in adverse environmental effects in terms of radiation exposure, which far outweigh any additional benefit, if any, to the electric consumer which may occur as a result of operation of the proposed Plant.

21. During the reprocessing aspect of the uranium fuel cycle, and in addition to radiation hazards connected therewith, there are additional and adverse environmental effects. Current reprocessing plants are fueled by conventional means and in most cases, are fueled by high sulfur coal. The reprocessing plants themselves, in the production of uranium for use at the proposed Plant, adversely affect the environment by emitting particulate matter, sulfur dioxide, oxides of nitrogen, and miscellaneous other noxious substances. Thus, the very production of reprocessed fuel, for so-called clean nuclear power, creates conventional pollutants which are emitted to the atmosphere. There is no discussion, for example, as to whether such conventional pollutants emitted by reprocessing plants in the course of reprocessing fuel would create more costs and risks to the environment than similar conventional pollutants which might be emitted if the proposed Plant were a conventional power plant.

22. In addition to conventional pollutants, reprocessing plants release, in normal operations, radioactivity in gaseous and liquid forms. There is no discussion of the amounts, character, and effects of such radioactive emissions; and since the Atomic Energy Commission does not apply either Part 20 Standards or the as low as practicable formula to reprocessing plants, it is conceivable that the total amount of radio-

active emissions which will reach the environment as a result of the operation of the proposed Plant will exceed safe and tolerable limits. In addition, incremental radioactive releases from reprocessing plants created by virtue of the production of reprocessed fuel for the proposed Plant will be absolutely increased.

23. Environmental submissions by Applicant and the Regulatory Staff admit that low-level solid and liquid radioactive wastes will be generated by operation of the proposed Plant. There is an inadequate discussion of the character or environmental effects of such radioactive wastes; and (in the sense that each radionuclide is not listed either quantitatively or qualitively), no discussion of the incremental burden on the environment which will be created by such wastes from operation of the proposed Plant. In addition, neither Applicant nor the Atomic Energy Commission has considered fully where such wastes will be transported and stored; accordingly, as a matter of law, there has been no consideration as to whether costs and risks created thereby will be outweighed by alleged or asserted benefits. Indeed, there is no discussion or assurance that adequate facilities for storage and disposal of low-level radioactive wastes incrementally created by the proposed Plant will be available, considering the amount of low-level radioactive wastes generated and available for disposition and storage by nuclear power plants in operation and planned to be in operation during the life of the proposed Plant.

24. Uranium, as a source of fuel, is in low supply. Applicant and the Regulatory Staff have failed to discuss whether sufficient uranium ore will be available to

provide nuclear fuel for the proposed Plant, considering the amount of uranium ore which will be necessary to provide nuclear fuel for other reactors which will be in operation during the life of the proposed Plant. The Atomic Energy Commission has recently announced intentions to construct and develop a Breeder in order to provide further assurance that nuclear fuel will be available for the proposed Plant and other power plants which may be in operation during the life of the proposed Plant. The Breeder presents significant and unresolved safety, scientific, and environmental problems. Neither the Atomic Energy Commission nor the nuclear industry fully understand the risks and costs involved in the construction and operation of Breeders. Since the proposed Plant may rely upon nuclear fuel created by a Breeder, the risks and costs of the development and operation of Breeders must be analyzed against any alleged or asserted benefits, if any, that may be gained by construction and operation of the proposed Plant.

25. If the proposed Plant is constructed, it will have a defined, useful life. At the completion of its defined, useful life, something will have to be done with the Plant and all its radioactive components. Neither the Atomic Energy Commission nor the Applicant have addressed themselves to the economic, environmental, and social costs connected with decommissioning of the proposed Plant. In addition to the failure to have discussed the issue of decommissioning of the proposed Plant, neither Applicant nor the Atomic Energy Commission have any idea as to how they will decommission the proposed Plant, what consequences will result therefrom, what economic costs will be incurred, and what effect decommissioning will have upon the

development of the greater Tri-City area and the health and safety of the surrounding environment, including man and all other organisms. Unless the issue of decommissioning is adequately resolved, an appropriate analysis of risks and benefits associated with construction and operation of the proposed Plant cannot be made.

26 Throughout the Uranium Fuel Cycle, including in a more general sense the proposed development of the Breeder and the decommissioning of the proposed Plant, accidents may occur in the transporting and handling of radioactive material. Accidents may result from negligence or intentional acts, such as sabotage. There exists no meaningful discussion by either Applicant or the Regulatory Staff as to the character of such accidents, ways in which they will be prevented, adverse or beneficial consequences from such accidents, and the economic and other environmental costs associated therewith. To the extent that such accidents increase the total amount of radioactivity emitted to the environment, they represent a consideration for additional costs and risks which must be judged against the alleged or asserted benefits from the proposed Plant.

27. Throughout the Uranium Fuel Cycle, including in a more general sense the proposed development of the Breeder and the decommissioning of the proposed Plant, various amounts of radioactivity in differing character will be released to the environment. Since such radioactivity, by definition, does not dissipate immediately, it tends to build up in the environment and various of its component parts, including man and other organisms and water. Since component parts of the environment tend to concentrate or biologically magnify radiation, the total amount of radiation which could affect man and other organisms is underestimated by Applicant and the Regulatory Staff. Accordingly, both short and long-term risks and costs associated with such magnified radiation have not adequately been assessed in light of presumed or asserted benefits. Biological magnification or concentration occurs in various ways. Thus, for example, radioactive material which is deposited on plant life or soil will ultimately reach water and the organisms contained therein and the organisms depending on that water for their sustenance. Because of biological magnification and concentration, radioactivity originally deposited on the soil and plants will have a far greater adverse effect when man and other organisms are exposed to or ingest such radioactivity at the end of the aforesaid cycle. In addition, there is biological magnification or concentration of radioactivity in food chain cycles, which begin directly by the discharge of radioactivity to water.

28. Applicant and the Regulatory Staff have struck an erroneous balance between the benefits, if any, to be derived from the proposed Plant and the risks and costs involved in the consequences of a postulated loss of coolant accident resulting in an uncontrolled meltdown. Because of the inadequate experimental and other data which underlies the opinions and conclusions of Applicant and the Regulatory Staff regarding the effectiveness of the Emergency Core Cooling System and the so-called Interim Criteria concerning such System and because alternative and safer methods of producing electricity are available, the proposed Plant results in an intentional infliction of risks and costs upon the public and a violation of

the Atomic Energy Act and the National Environmental Policy Act. Intervenors hereby incorporate by reference the substantive contentions in the Petition to Participate filed in Docket RM 50-1 on behalf of the National Coalition of Intervenors. That Petition to Participate sets forth specific contentions respecting the inadequate basis of the Interim Criteria and Applicant's Emergency Core Cooling System, and Intervenors here urge the same contentions in order to challenge the erroneousness of the resolution of the related cost-benefit analysis.

VI

ALLEGED BENEFITS

29. There are no benefits to be derived from operation of the proposed Plant, and, alternatively, all risks and costs greatly outweigh any alleged or asserted benefits.

30. Intervenors contend that there is no valid benefit at all in connection with the proposed Plant. Applicant and Regulatory Staff analyses of the alleged benefits are found respectively at Pages 5.1-1 through 5.1-4 of Volume 1 of Applicant's Supplemental Environmental Report and the bottom half of Page 125 and the first paragraph of Page 126 of the Regulatory Staff's Draft Detailed Statement. Aside from the fact that these discussions are an insult to intelligence, they clearly demonstrate that there are no benefits to be derived from the operation of the proposed Plant.

31. The additional electricity available from the proposed Plant is not a benefit. Additional electric generation through nuclear power merely creates risks and costs to the environment. Moreover, at a time when our

alleged energy demands are increasing, it is not beneficial to continue to add to the production of electricity without increasing our understanding how any demand for electricity is created. And, thus, to the extent that electricity demand is created by virtue of promotional activities or other such efforts of Applicant and the Atomic Energy Commission, any increase of electricity is not a benefit, but an unwarranted cost to the environment. Applicant, other utilities, the Atomic Energy Commission, the Federal Power Commission and the nuclear industry have created an artificial demand for electricity, and no environmental analysis should reward such efforts.

32. Neither Applicant nor the Regulatory Staff has considered the possibility of changing the present social stimuli to society which could result in decreased demand for electricity, thereby not requiring the production of electricity from the proposed Plant. Elsewhere in this statement, we will set forth more specifically our contentions with respect to Applicant's projected load forecasts which we believe are invalid and in some instances untrue.

33. Applicant and Regulatory Staff assert that the proposed Plant would create a benefit resulting from shutting down Dow Chemical's fossil fired facilities. There is no serious anaylsis, however, as to whether Dow Chemical can purchase power from other of Applicant's generating facilities, or whether indeed, in the long run, it would be less costly to the environment to require Dow Chemical to retrofit or update its facilities to provide for fossil fuel generation of electricity without resultant pollutants. In the long run, it would make more sense to require Dow Chemical and others (by denying electricity from the pro-

posed Plant) to investigate ways and means of generating electricity through conventional means or other means not now known to man which could result in less risks and costs than the generation of electricity through nuclear power plants. The assertion that the generation of electricity from the proposed Plant is a benefit because it shuts down fossil fired plants is in reality trading one risk for another. Thus, before such a conclusion is sound, one must evaluate the effects of pollutants from conventional power sources against the effects of normal and abnormal releases of radiation. Since Dow Chemical has been polluting Midland for several decades with its fossil fired facilities, sufficient information should be available to determine what the effects have been and then one could compare them with known effects of radiation upon man and the environment.

34. Applicant and the Regulatory Staff assert that the proposed Plant will provide economic growth for the Midland Community and enable Dow Chemical to expand its facilities by virtue of having available to it low cost energy. There is no discussion, however, as to whether the Midland Community should encourage expanding industry or whether other uses should be found for the land and resources which will be required in such expansion. Moreover, since Dow Chemical presently has available to it in its organization areas, admittedly low cost energy areas, within which it could expand, there must be an analysis of the environmental effects of the Dow Chemical expanding in Midland as opposed to elsewhere in order to justify the suggestion that Dow Chemical's expansion is a benefit. Finally, in any such analysis, if it is determined that the character and type of the Dow

Chemical expansion will result in undesirable products, such as, for example, the creation of chlorinated hydrocarbons or 2-4-5-T, then the subsidization of Dow Chemical by virtue of the construction and operation of the proposed Plant results in additional costs to the environment without any concurrent benefits.

35. Most of the employment asserted to occur as a result of the construction of the proposed Plant is short-termed in duration. No analysis has been made as to whether it would be more sound to arrange permanent employment of the so-called peak labor force of 700 men which allegedly will be used during construction rather than spend millions of dollars in the construction of the Plant for a two or three year employment of 700 men. There will be no significant increase in employment of Dow Chemical as a result of any expansion of its facilities, which may occur as a result of the construction of the proposed Plant; and, in fact, Intervenors contend that the expansion of the Dow facilities will result in a decrease of employment in the Midland Community.

36. Applicant and Regulatory Staff assert that a benefit from the proposed Plant will be additional revenues and taxes. This is a specious argument and clearly is not a benefit entitled to consideration in a NEPA review, since revenues and taxes may flow from undesirable as well as desirable ventures vis-a-vis the environment. Additional taxes and revenues could be generated by proposing higher taxes on existing generating facilities which contribute to pollution and by imposing severe fines on Dow Chemical and Dow Corning for having polluted Midland and other areas of the United States for several decades.

37. Because available statistics demonstrate that nuclear power plants suffer as compared to fossil fired plants, more forced outages for reasons of maintenance, unreliability, and inadequate research, the construction of a nuclear power plant as a base load or peaking load generating facility actually results in inefficient generation of electricity and, accordingly, costs and risks to the environment and not benefits.

38. The proliferation of nuclear power plants and the construction of the proposed Plant will deter research and development into more sophisticated pollution controls for fossil fuel plants, into nuclear safety, in alternative methods of generating electricity, into an analysis of utilities' assertions as to rising demands for electricity and will deter exploration for gas, coal and other fossil fuels. Finally, construction of the proposed plan will further encourage a commitment to nuclear power and the Breeder at a time when there are substantial unresolved areas of scientific and environmental concern.

38A. Applicant has asserted, as stated above, that one of the benefits emanating from the proposed Plant will be the elimination of fossil fired generating capacity both in Applicant's system and in other generating facilities such as Dow Chemical. Assuming the validity of this statement, in order adequately assess the full nature of any alleged benefit, it is important to consider whether the proposed Plant will assist in reducing fossil fired generating facilities of other than Applicant and Dow. Thus, for example, there are generating municipalities and municipal power pools (consumer rather than investor owned) which have demanded purchase from or access to electricity to be generated from the proposed Plant. Assuming the

validity of Applicant's and the Regulatory Staff's contention in this area, it is necessary to analyze whether the Plant is suitably sited and sized in order to spread any alleged benefit throughout the relevant franchise area. The municipalities and consumer owned electrical cooperatives whose needs should be considered in such an analysis include Coldwater, Michigan, Holland, Michigan, Traverse City, Michigan, Grand Haven, Michigan, Zeeland, Michigan, the Northern Michigan Electric Cooperative, and the Wolverine Electric Cooperation. These municipalities and cooperatives have a justifiable interest in purchasing from or access to electricity from the proposed Plant, assuming the validity of Applicant's contention with respect to alleged benefits.

38B. One or more of the above municipalities and cooperatives are so situated so that interconnections could take place between each or all of them and Applicant granting them access to electricity from the proposed Plant, to electricity from Applicant's existing generating facilities and to transmission lines existing or to be built in connection with Applicant's generating of electricity. An adequate environmental analysis of costs and benefits must include the environmental impact which may occur as a result of Applicant's failure to or agreement to provide access to such municipalities and cooperatives to electricity from the proposed Plant and from Applicant's existing generating facilities (including its interconnection partners in the Michigan Power Pool and the ECAR Region) as well as access to transmission lines existing or to be built by Applicant. Thus, the validity of any alleged benefit is a function of that benefit's availability to all coordinating utilities in the relevant area.

Intervenors contend that Applicant's illegal policies regarding the sale of electricity, the sharing of generating facilities, and the nonavailability of its transmission lines has or could result in adverse environmental impact as a result of other coordinating utilities not having an available input into Applicant's huge and monopolistic position in the greater Michigan area.

VII

ALTERNATIVES TO THE PRODUCTION OF ELECTRICITY BY NUCLEAR POWER AND TO THE PRODUCTION OF ELECTRICITY FROM THE PROPOSED PLANT

39. Beginning from the time of initial development of civilian uses of nuclear power to the present, the Atomic Energy Commission, utilities, and the nuclear industry have underestimated, misreported, and misrepresented the safety, environmental impact, and reliability of nuclear power plants for the generation of electricity. Nuclear power plants were constructed and built without respect to the environment until the Atomic Energy Commission amended its illegal policy regarding environmental protection. During this period of time, the Atomic Energy Commission, utilities, and the nuclear industry were actively engaged in the promotion of nuclear power, without respect to criteria and standards necessary for the health and safety of the public and their environmental protection. Significant safety programs such as the Loss of Fluid Test ("LOFT"), although admittedly necessary to analyze the safety of emergency systems, have not been completed. Thus, despite the fact that the

Atomic Energy Commission has admitted that its prior conservative assumptions with respect to safety have not provided reasonable assurance of margins of safety, the Atomic Energy Commission, utilities, and the nuclear industry continue to press for nuclear power plants, content to await necessary safety and environmental research after substantial commitments of resources have been made. The aforesaid and illegal promotional program is intended to subject the general public and persons living within the Tri-City area to the risks of nuclear power plants without sufficent analysis of available alternatives. The program is intended to create a *fait accompli* prior to any meaningful analysis.

40. All of the risks associated with nuclear power, including scientific, safety, and environmental risks with respect to the proposed Plant, have not been explained or released or made available to the public so as to provide a foundation for a cost or risk-benefit analysis. Since the consequences of a loss of coolant or a more severe accident are far greater than the consequences of an accident from a conventional power plant, such risks must be evaluated in light of the relevant benefits, if any, resulting from the construction of a nuclear or fossil fired generating facility.

41. As of January 1, 1972, there were a total of 23 nuclear generating units in operation. These reactors are primarily of an older generation and have a Mw size smaller than the size of the reactors presently planned to be constructed generally as well as the proposed Plant. There has not only been a lack of experience with respect to reactors the size of the proposed Plant, there has also been no experimental data or significant experience with reactors the size

of the proposed Plant or larger. The Atomic Energy Commission's safety program with respect to light water-cooled reactors has been insufficient and devoid of regulatory responsibility. The so-called safety program has been geared to promotion and agrandizement of power by an administrative agency without regard to the public health and safety.

42. The result of substantial commitments of resources prior to analysis of safety and environmental problems has been to encourage the Atomic Energy Commission and others to ignore and avoid a complete analysis of alternative methods for the generating of electricity. This is because the Atomic Energy Commission is a single purpose agency uninterested in sponsoring for any reason the construction of other than nuclear power plants. Accordingly, all analyses by the Regulatory Staff have been biased and non-objective; for example, to date, the Regulatory Staff has not, with respect to any license application, recommended the construction of other than a nuclear power plant. It is inconceivable that an unbiased and objective analysis would not produce at least one instance where other than a nuclear power plant was suggested for construction.

43. As a further evidence of their promotional efforts, the Regulatory Staff and Applicant have failed with respect to the proposed Plant to make a sincere analysis of alternative methods for generating electricity; the Regulatory Staff has not performed any independent inquiry but rather has adopted, uncritically, the position tendered by the Applicant. Thus, inquiries into alternatives have been short-sighted, misrepresented, and, in instances, intentionally colored.

44. A threshold inquiry into the alternatives to the generation of electricity from the proposed Plant is whether additional electrical generation from Applicant is necessary from the proposed Plant in light of all of the relevant circumstances. To the extent that this contention also reflects a need for analysis of the alleged need for power, we incorporate hereby reference that section of these Contentions dealing with the need for power. Additionally, and notwithstanding assertions of need for power, a full and complete analysis of alternatives must include a consideration of all other power available to Applicant from its own system, from utilities from which it is currently purchasing power, and from utilities from which it could purchase power by virtue of contractual or interconnecting commitments.

45. Intervenors contend that there is no need for electricity from the proposed Plant in light of the short and long-term plans of Applicant to build additional facilities. Thus, electricity from the proposed Plant is unnecessary and results in an unwarranted cost to the environment.

46. Applicant, without construction of the proposed Plant, will be able to meet its valid demands for the generation of electricity by virtue of purchasing power from one or more of the following sources:

(a) Power Pools and Regional Associations of which Applicant is a member;

(b) Power Pools and Regional Associations of which Applicant is not a member but which it could join;

(c) Making contractual arrangements for *firm* commitments for power resulting in a guaranteed

source of supply, rather than making no commitments and relying upon future availability;

(d) From other than investor owned utilities, having different peak periods than Applicant, with whom Applicant could interconnect on a national or international basis; and

(e) From investor owned utilities having different peak periods than Applicant with whom Applicant could interconnect on a national or international basis.

In any analysis of the various alternatives available to Applicant (instead of electricity alleged necessary from the proposed Plant), Intervenors contend that all of the long-term construction plans of every available source of power must be considered. In other words, in order to ascertain what sources of power or alternatives are available to Applicant, one must analyze and consider the short and long-term construction program of every available source of power in the United States and Canada. Intervenors contend that an analysis of available sources of power, even assuming a need for power, will demonstrate that the proposed Plant results in an unwarranted cost to the environment.

47. Intervenors contend that Applicant and the Regulatory Staff have been engaged in promotional efforts to create a false demand for electricity; and all of the electricity to be generated from the proposed Plant is, therefore, not necessary for Applicant's franchised area. Accordingly, the construction and operation of the proposed Plant will not provide any benefit to electrical users and the proposed Plant represents an unwarranted cost to the environment. Intervenors

further contend that Applicant, by virtue of advertising campaigns directed toward further use of electricity during peak periods, as well as advertising campaigns deficient in explaining to users in its franchised area methods of decreasing peak period use of electricity, have contributed in whole or in part to the demand for electricity from the proposed Plant; and accordingly, for this additional reason, the proposed Plant represents an unwarranted cost to the environment.

48. Intervenors contend that the sole or primary motivating reason for the proposed Plant is an effort toward public subsidization of a private industry, to wit: Dow Chemical Company. Dow Chemical has available to it methods of purchasing or creating electricity and process steam, which would result in less cost to the environment than the purchase of electricity and process steam from the proposed Plant. Thus, Dow Chemical may retrofit and clean up its own facilities, it may purchase from other than Applicant, it may purchase from other of Applicant's generating facilities, and/or it may expand or move its facilities to other areas of the United States where low cost energy is already available. To the extent that the proposed Plant is to be constructed and operated in substantial part for the benefit of Dow Chemical Company, it represents an unwarranted cost to the environment.

49. Applicant and the Michigan Public Service Commission have illegally created an incentive for continual construction of generating facilities when they are unnecessary. The rate structure imposed upon Applicant by the Michigan Public Service Commission encourages Applicant to create unwarranted costs upon the environment. Because Applicant's ability to

receive a fair return on its invested capital is directly related to outstanding amounts of unamortized construction and other capital costs, Applicant has an incentive to continue to construct power facilities, whether necessary or not, in order to maintain an artificially high rate structure. Specifically, Intervenors contend that Applicant is failing to use existing generating facilities to the extent of their useful lives and it is taking such facilities out of base load or peaking service after such facilities have been amortized and removed from consideration of Applicant's rate structure. Thus, the proposed Plant represents an attempt to construct a facility in order to maintain an artificially high rate structure and, as such, it represents an unwarranted cost to the environment.

50. Applicant and the Regulatory Staff have erroneously concluded that natural resources are unavailable in sufficient quantities to supply fuel for fossil fired power plants. To the contrary, uranium of all fuels is in the shortest supply and considering a rational exploitation of resources, Applicant — if it needs power —should be building other than a nuclear power plant. Intervenors contend that there are sufficient reserves of gas, oil, and coal, individually or collectively, to provide fuel for a fossil fired plant. Moreover, Intervenors contend that it is within the state of the art or would be within the state of the art at the time of completion of construction of a fossil fired power plant, to abate all or substantially all adverse and environmental effects which might occur as a result of a fossil fired plant. Thus, considering availability of resources, pollution abatement, and nuclear safety, the choice of the proposed Plant over

other alternatives represents an unwarranted cost to the environment.

51. Intervenors contend that not only are there sufficient supplies of coal, oil, and gas (and insufficient supplies of uranium), but also that supplies of coal, oil, and gas, are or would be at the time of completion of construction of a fossil fired plant, readily available to Applicant. Assumptions by the Applicant and the Regulatory Staff that coal, gas, and oil, although in existence is not practically available, are a direct result of the massive promotion of nuclear power. Thus, if Applicant finds it is in short supply of gas, oil, and coal, it is not because such resources are unavailable, but rather because Applicant, other utilities, and the Atomic Energy Commission have discouraged exploration and development of coal, gas, and oil reserves. Based upon the availability of coal, oil, and gas and the unavailability of uranium, the proposed Plant represents an unwarranted cost to the environment. To the extent that the Breeder is intended to provide fuel for the proposed Plant during any part of its defined useful life, the environmental, scientific, and safety problems in connection with the Breeder must be analyzed. In this vein, Intervenors contend that the Breeder is subject to such a myriad of unresolved problems that it will never be developed. Moreover, the Breeder will be the subject of intensive litigation and, accordingly, any reliance upon the Breeder for fuel in the near or short-term, is an unwarranted assumption.

52. Even considering the generation of any needed electricity by a fossil fired plant without additional pollution abatement facilities, harmful and adverse effects and dangers from radiation greatly outweigh any

harmful and adverse effects from pollution which may be emitted from a fossil fired plant. This is because radiation effects are long-term in contrast to effects of conventional pollutants, because radiation effects cover a broader geographical area than do effects of pollutants from a given fossil fired plant, because available safety measures are more sophisticated and more reliabe in fossil fired plants, and because a fossil fired plant is more reliable in terms of maintenance and forced outages. Accordingly, the selection of the proposed Plant imposes an unwarranted cost upon the environment.

53. Proliferation of nuclear power plants and the building of the proposed Plant deter persons, firms, corporations, and government from research and development into alternatives to nuclear power. Since, because of a short supply of uranium and the present inability to resolve problems concerning the Breeder, nuclear technology is a "stop gap" and short-term technology, construction and operation of the proposed Plant will continue to deter research and development into alternative methods for the generation of electricity, such as fusion, solar energy, magnetohydrodynamics, geothermal and other methods for the production of electricity. As a result, the construction of the proposed Plant represents a serious and unwarranted long-term cost and risk to the environment and to the development of future and alternative methods for the generation of electricity which may be needed in the future.

54. Since announcement of the proposed Plant, Applicant has increased almost 100 percent its estimate for the total cost of the project. Costs have escalated because of public re-examination of nuclear power, be-

cause additional safety research has required amendment of the project in terms of hardware, and because of delays in connection with the licensing of nuclear power plants. Moreover, as Applicant admits, further delays are imminent because of an ongoing antitrust review not only delaying the proposed Plant but also resulting in the probability that Applicant may not be able to use in its system all of the electricity which could be generated from the proposed Plant. None of these delays or costs are evident in the construction of a fossil fired plant. Accordingly, the proposed Plant represents the selection of the most expensive and insufficient method of supplying any alleged demand for electricity and results in an unwarranted cost to the environment.

55. Assuming the validity of Applicant's assertion that it is necessary to build the proposed Plant for the production of electricity, Applicant has selected the wrong site for the Plant considering costs of generating electricity from other sites and considering the closeness to the proposed site to a large population center. Additionally, Applicant has not selected the most efficient method of dissipating waste heat inasmuch as cooling towers, and specifically dry cooling towers, represent a better alternative than does the inadequate cooling facilities presently planned by Applicant.

VIII

SURVEILLANCE AND MONITORING PROGRAMS ARE NOT COMPLETE AND ARE INADEQUATE IN ORDER TO ASSESS FULLY THE ENVIRONMENTAL IMPACT OF THE PROPOSED PLANT

56. Assuming that Applicant will construct the proposed Plant, during the period of construction and thereafter, inadequate monitoring and surveillance programs and measures have been taken by Applicant or suggested by the Regulatory Staff. As a conseqence, Applicant will not, unless different monitoring and surveillance programs are adopted, be able to assess adequately the environmental impact of the proposed Plant to be in a position to take remedial and prophylactic measures. Intervenors contend that pre and post operational surveillance programs in connection with radiation, thermal, chemical, and noise emissions from the proposed Plant are deficient in at least the following respects.

57. The radiation surveillance program planned by Applicant is not sufficient adequately to monitor the effects of the proposed Plant:

(a) Applicant's proposed radiation monitoring program will not provide, in the areas for which it is intended, a sufficient understanding of background radiation and additive radiation created by the proposed Plant because there are too few monitoring sites selected and because the frequency of monitoring at such insufficient sites is too irregular.

(b) There are, Intervenors contend, several other areas of radiation effects which Applicant does not plan to monitor at all. It is Intervenors contention that a substantial monitoring of such areas must be made pre and post operational in order adequately to assess the environmental impact of radiation emissions from the proposed Plant. These areas are:

1. Phytoplankton;
2. Aquatic plants other than phytoplankton;
3. Terrestrial plants, including agricultural crops;
4. Zooplankton;
5. Benthic organisms;
6. Agnathans;
7. Osteichthyes;
8. Amphibians;
9. Reptiles;
10. Aves;
11. Mammals;
12. All sources of food grown or produced within a 50-mile radius of the proposed Plant, which food may be consumed within or without the 50-mile radius of the proposed Plant.

The radiation monitoring and surveillance program with respect to the above areas should be of a sufficient scope so that the monitoring will detect effects of direct radiation, such as directly on to soil and plants, and indirect radiation such as when a terrestrial animal consumes a plant that has been irradiated

or when a man eats a terrestrial animal which has consumed a plant which has been irradiated. Moreover, the program should include methods to determine concentration and biological magnification of radiation in the entire food chain. Intervenors contend that without such monitoring programs, an adequate environmental assessment of radiation risks and costs will not be made; and also without proper surveillance and monitoring, Applicant and the Regulatory Staff will be unable to take remedial and prophylactic measures regarding radiation effects.

58. Surveillance and monitoring of thermal effects from the proposed Plant are inadequate in that sufficient sites are not provided for and at such insufficient sites, the frequency of monitoring is inadequate. Moreover, the description of the Thermal Monitoring Program is so vague so as not to provide a meaningful point of departure for a substantive discussion. Additional sites should be provided on the River, Bullock Creek, Saginaw River, Pine River, Chippewa River, Cass River, and Lake Huron. The scope of the Thermal Monitoring Program should be sufficient so as to assess the thermal effect upon all organisms which inhabit each of the bodies of waters or rely upon each of the bodies of waters as a source of food and water.

59. Applicant does not propose and the Regulatory Staff has not suggested monitoring the indirect effects of thermal discharges from the proposed Plant. Thus, the health and development of terrestrial plants and animals may be adversely affected by changes in ambient air temperature due to thermal discharges.

60. Despite the fact that chemicals will be discharged into various bodies of water both by Applicant and

Dow as a result of the operation of the proposed Plant, neither Applicant nor Dow has been required to develop monitoring programs of sufficient frequency and scope with respect to such chemical discharges. Intervenors contend that the absence of any monitoring of chemical discharges represents a failure in an adequate environmental analysis.

61. Applicant has neither discussed nor proposed to monitor noise pollution which will be created by the construction and operation of the proposed Plant. Applicant should establish a monitoring program of sufficient frequency and scope so as to be able to monitor noise pollution and its effects upon man and other animals.

62. In addition to monitoring and surveillance by Applicant, since Applicant, Dow Chemical, and the Regulatory Staff have supported the construction of the proposed Plant at least in part so as to provide a benefit to Dow Chemical Company, in return for the benefit it will be receiving, Dow must have environmentally clean hands. Accordingly, Dow Chemical Company should be required to monitor its discharges in the areas of thermal, chemical, and noise from its own facilities so as to determine whether it should be rewarded with low-cost energy for purposes of expansion of its facilities. Dow Chemical's monitoring and surveillance should include frequency and scope at least as comprehensive as Intervenors have contended should be required of Applicant.

63. Intervenors contend that the cost of a monitoring and surveillance program discussed in this section should be borne by Applicant and Dow Chemical Company and not passed on to the public by requiring the Michigan Water Resources Commission to do the work.

IX

PROCEDURAL INADEQUACIES WITH RESPECT TO THE REGULATORY STAFF DRAFT DETAILED ENVIRONMENTAL STATEMENT

64. The National Environmental Policy Act requires the Atomic Energy Commission to make an independent detailed environmental analysis concerning the licensing of the construction of the proposed Plant. Situated throughout this Statement of Contentions are areas of environmental impact which the Regulatory Staff has failed to consider. Accordingly, the Statement is insufficient as a matter of law for not considering such areas.

65. The Regulatory Staff has illegally contracted its obligation to prepare the Draft Statement to Argonne National Laboratory. The arrangements between the Regulatory Staff and Argonne are unknown to Intervenors and, accordingly, they cannot make further contentions with respect to the procedural inadequacies of the relationship. For example, we do not know whether Argonne was requested to do independent analysis or whether, as appears from the Draft Statement, Argonne and the Regulatory Staff have only accepted, uncritically, submissions by the Applicant.

66. Based upon information and belief, Intervenors contend that the Regulatory Staff and its contractees have failed to provide an independent, substantive review required by the National Environmental Policy Act.

67. The Draft Detailed Statement fails to incorporate all of the information upon which it is based and fails

to include a complete discussion of all sides of a particular issue. As such, the Draft Detailed Statement is an incomplete environmental analysis and is insufficient as a matter of law.

68. The Regulatory Staff has failed to secure comments on a realistic schedule from all of the Federal, State, and Local agencies which have an interest in commenting. Moreover, because the Regulatory Staff has only provided for a less than 30-day comment period (considering mailing time), there is insufficient time for various of the agencies adequately to comment upon the Draft Detailed Statement. Accordingly, this procedural inadequacy built into the Regulatory Staff's preparation has resulted in an inadequate analysis.

69. The Regulatory Staff has failed to quantify and qualify in monetary terms all the costs, risks, and alleged benefits with the result that a sound, economic environmental analysis cannot be made. Moreover, the Regulatory Staff has as yet to prepare, for the guidance of Applicant, guides for preparation of environmental reports by those who are seeking construction permits. As such, the Regulatory Staff has failed to implement its obligations pursuant to the National Environmental Policy Act.

70. The Regulatory Staff has not required sufficient detailed preparation by Applicant of all areas of environmental concern and, therefore, in its implementation of its responsibilities under the National Environmental Policy Act, the Regulatory Staff has failed to acquire adequate investigation and reports by Applicant and its consultants.

71. The Regulatory Staff has failed to describe all risks inherent in the generation of electricity by nuclear power; and, accordingly, the Draft Detailed Statement is incomplete. For example, the aspects, both in terms of destruction of life and property, of a postulated loss of coolant accident resulting in an uncontrolled meltdown are not factored into the Regulatory Staff's Draft Statement.

72. The Regulatory Staff has failed to consider the actual cost of generating electricity through nuclear power. The actual cost includes such direct and indirect costs as increased cancer and leukemia, medical costs relating to those and other diseases from radiation exposure, and costs of decommissioning the proposed Plant when its defined useful life is over. The failure of the Regulatory Staff to have considered these costs, as well as the cost of disposal of high and low level radioactive wastes results in the Draft Detailed Statement being insufficient as a matter of law.

X

ENVIRONMENTAL CONTENTIONS WITH RESPECT TO THE ALLEGED NEED FOR POWER GENERALLY AS WELL AS FROM THE PROPOSED PLANT

73. The issue of demand for power or need for power is not a function of a simple application of projected figures to rated generating capacity. In the last two decades, we have seen a demand for electricity multiply, at least as interpreted by the utilities, the power industry, the Atomic Energy Commission, and other administrative agencies. A simple arithmetic extension of the present demand curve, as so asserted, makes it clear that in a very short period of time our economy will not be able to meet such a demand. There has been a failure to do any analysis as to means to create a *decrease* in demand for electricity or an elimination or curtailment of industrial and other uses of electricity which could be decreased or eliminated so the economy does not suffer in terms of goods and services. From a long range environmental standpoint, the social and scientific stimuli currently being injected into our economy encouraging peak uses of electricity must be eliminated. It is in this sense, as well as in the more practical sense of an analysis of actual figures produced by Applicant and the Regulatory Staff, against which any need or demand for power must be analyzed.

74. Intervenors contend that under the National Environmental Policy Act the proposed Plant may not be licensed unless it is demonstrated that the electricity allegedly needed from the proposed Plant, is unavailable to Applicant and/or the users in Applicant's area from any other source and, unless it is demonstrated that such demand for electricity represents useful social stimuli considering the long range rationalization of our national energy policy.

75. Intervenors contend that any demand for electricity generated by advertising or promotional efforts or by competition among public utilities to encourage the use of electricity cannot validly be rewarded pursuant to the National Environmental Policy Act.

76. Intervenors contend that in making an analysis of the promotional or advertising aspects of any demand for power, one must analyze actual advertising figures the

results of advertising campaigns, and a comparison of those results with statistics in areas, if any, where promotional advertising as a function of demand has not taken place. Moreover, any environmental analysis must consider whether a demand is created by encouraging the public to use unnecessary or non-utilitarian products which use large amounts of energy in the course of fabrication and production. Thus, if any portion of Applicant's demand is directly related to the production of such goods, an analysis has to be made as to whether the production of such goods should be encouraged or whether by a denial of electricity, one encourages the production of alternative goods which have similar end uses, but which require substantially lesser amounts of electrical energy to produce.

76A. Intervenors contend that notwithstanding promotional or advertising efforts and notwithstanding the lack of analysis of the end uses of energy, Applicant and the Regulatory Staff have failed to set forth adequately a responsible record upon which to substantiate claims for demand or need for electricity from the proposed Plant.

77. Applicant recently announced (January 1972) that it was cancelling construction of a Combined Cycle Plant because its statistics underlying the demand and the need for such a plant had been re-evaluated and were not correct. The same demand figures, which Applicant has admitted are no longer up to date, are being used to support the claim for demand for electricity from the proposed Plant.

78. Applicant's survey and analysis leading to its projected load forecasts is unsound in that it overstates

the future industrial needs of Michigan, the future population growth of Michigan, and fails to recognize that demand for electricity will decrease on an absolute and percentage basis. Moreover, Intervenors contend that Applicant has not considered all generating facilities which would be available, given certain interconnections, to consumers in its franchise area and, accordingly, Applicant has used a statistically erroneous geographic area in which to analyze a demand for electricity. Thus, Applicant's statement of electric reserves is misleading in that it does not cover all available reserves.

79. Applicant and the Regulatory Staff's analyses assume that the need for power is constant and firm and will remain so during at least the ten year period between 1970 and 1980. There is no basis for making this assumption or relying upon statistics during the period 1960 to 1970 because the factors governing each such period are not identical. For example, the rate of population increase during the ten year period, 1960 to 1970, was significantly greater than is or will be the rate of population increase during the period 1970 to 1980. Applicant's analysis has not taken into account this difference.

80. Applicant's analysis with regard to projected power needs is based, in substantial part, on past statistics. Applicant does not take into account that much of the power generated in earlier base periods was of a horizontal character in the sense that areas which never before had access to electricity were provided a source of electricity. Applicant and the Regulatory Staff have not taken into consideration in their projected land forecasts that such needs for electricity have

already been met by virtue of existing generating capacity.

81. Applicant's projection assumes a continued growth and development of industry in the State of Michigan. Applicant has not adequately assessed the fact that there is a national and statewide conservation movement which may severely inhibit increases in industry. Applicant also has not considered the possibility that industry in Michigan will seek to expand elsewhere and, thus, not be available to support an alleged increase in demand.

82. Applicant and the Regulatory Staff assert that the electricity from the proposed Plant is needed in order to maintain a rate structure which is competitive with the cost of energy in other States. Applicant fails to recognize that the National Environmental Policy Act requires a long range analysis and, as such, does not permit Applicant to assume that somehow the State of Michigan and Applicant are to be favored over some other area. It may be inconsistent with the National Environmental Policy Act and a rational resolution of our National Energy Policy to encourage further electricity uses in the State of Michigan. Finally, in its so-called competitive analysis, Applicant has failed to take into account what effect, if any, the increased purchase of power (by virtue of a national interconnection of grids) would have upon the alleged need for power.

83. Applicant has failed to analyze its need for power in light of any environmentally sound program to share electricity with coordinating utilities within and without the State of Michigan and, particularly, municipalities and consumer owned cooperatives.

84. Applicant and the Regulatory Staff have in part asserted a need for power from the proposed Plant in order to retire older, less efficient, fossil fired plants, However, Applicant has failed adequately to compare the reliability of fossil fired plants with the reliability of nuclear power plants and the proposed Plant.

85. Applicant asserts that the proposed Plant is necessary to provide "a plentiful and inexpensive supply of electricity . . . to maintain and enhance the living standards. . . ." Applicant has failed to analyze, however, either the need to conserve energy resources, a need which appears to be environmentally more sound than a need to make energy resources more plentiful. Applicant does not state whose living standards are going to be increased by the proposed Plant, and it does not analyze whether any substantial segment of the population's living standards may be decreased as a result of the proposed Plant in terms of a degraded environment which would adversely affect health, life, and property.

86. Applicant's projected demand erroneously assumes that all future needs for electricity will be increased or new demand and will not reflect merely replacement demand. For example, it is true that there may be increased residential construction; however, Applicant ignores that a person who builds a new home may be, at the same time, vacating an old home — which new home would not, therefore, represent an increase in demand for electricity.

87. There is no basis for Applicant's assumption that room air conditioners will increase from 160,000 to 360,000 in four years and that they all will be used at

peak periods, particularly if the citizens are educated to conserve energy.

88. Applicant has misanalyzed the projected growth of its major users of electricity such as General Motors and Dow Chemical. The projected increases in production and uses of electricity by such major users are inordinately high in light of the rate of population for the applicable base period and the national movement to conserve electricity. Concomitantly, Applicant has failed to factor into its projection the possibility that rate structures will be revised so as to make large use of electricity on a per unit basis more expensive thereby discouraging the increased use of electricity.

89. Applicant has erroneously assumed that the Gross National Product will continue to spiral. The relationship which the Applicant asserts exists between the automobile industry and the Gross National Product does not take into consideration that many metropolitan areas, including those in the State of Michigan, are encouraging the development of mass transit which would result in a relative decrease in the production of automobiles.

90. Applicant has incorrectly stated the current demand for electricity in light of reports by the Edison Electric Institute and the Association of Electrical Illuminating Companies. The Annual Report published in late 1971 by the Edison Electric Institute disagrees with Applicant's assertions as to the character and scope of a so-called "power crisis."

91. Applicant's projections with respect to electrical needs for street and highway lighting are unsound. Applicant's own figures show a decrease in street and high-

way lighting for the years 1971 and 1972. These figures do not support Applicant's projections for the years 1973 and beyond, particularly since highway and super-highway construction has and will become more limited.

92. Applicant has not provided any support and, accordingly, its analysis is unsound, with respect to its claim for the need for electricity will provide jobs for an increased number of adults. Once again, Applicant's projections have failed to take into account the environmental movement and the demands of society for industrial progress and national growth consistent with environmental protection.

93. Applicant's need for electricity insofar as it relates to its claim to further an improvement in air and water quality is specious, since Applicant fails to take into account the effects upon the environment, (absolutely and relatively by virtue of a cost-benefit analysis) of the production of electricity which assertedly will be used to replace alternative forms of the production of electricity.

94. The Regulatory Staff in connection with the need or demand for power has failed in its obligations to make an independent analysis, but rather has accepted, uncritically, statements of the Applicant.

XI

CERTIFICATION OF MICHIGAN WATER RESOURCES COMMISSION

95. Consistent with the Calvert Cliffs' decision, the Atomic Energy Commission has an obligation to evaluate and analyze state water qualify standards and revise such

standards in the event that they provide insufficient protection for the environment. Intervenors contend that the Water Resources Commission standards and its Water Quality Certification for the proposed Plant are based upon inadequate water quality standards. Accordingly, the National Environmental Policy Act requires the Atomic Energy Commission to review and upgrade such water quality standards.

96. The local laws of the State of Michigan (Section 6(a) of the Public Act 245 of the Act of 1929) makes it unlawful to discharge any substance into the state waters which is or may become injurious to the public health, safety and welfare. The state law does not provide an exception to permit discharges into state waters which may result in a concomitant benefit in an unrelated area. Accordingly, the Water Resources Commission has no authority to permit Applicant to make any discharges into state waters from the proposed Plant, and the Atomic Energy Commission may not, therefore, rely upon such an invalid water quality certification in the licensing of the proposed Plant.

97. The Water Resources Certification permits Applicant too long a period of time to report excesses of standards established by the Water Resources Commission. More frequent reporting is necessary to prevent negligent or intentional violations of the established water quality standards.

98. The Water Resources Certification is based upon a classification of differing standards for differing bodies of water throughout the State of Michigan. The Water Resources Commission has no such authority in light of the laws of Michigan, and the National Environmental Policy Act does not permit such a

classification which, by its operation, subjects some bodies of rivers to environmental degradation. Accordingly, the Water Resources Certification is based upon an illegal standard.

99. Assuming the validity of a classification of standards for bodies of rivers, the Water Resources Commission classification is insufficient in that based upon the existing quality of the River and Bullock Creek, the operation of the proposed Plant will violate all standards set forth by the Water Resources Commission in its Certification for the River and Bullock Creek, and more specifically described in (110) below. As such, the Water Resources Certification is insufficient.

100. The Water Resources Commission states that it is changing the designation of the River essentially from a standard of "tolerant fish" to a better standard of "intolerant fish." This change, due to become effective January 1, 1974, will not be able to be achieved if Applicant is permitted to operate the proposed Plant at the proposed site and as currently designed. This is particularly true in light of the fact that other industries, including, but not limited to, Dow Chemical Company and Dow Corning Company, continue to pollute the River and its confluences. Accordingly, permission to Applicant, in light of the circumstances, represents an unwarranted cost to the environment.

101. The Water Resources Commission Certification has failed to take into account the standard or criteria for discharges proposed by Applicant into Bullock Creek, and, thus, the Water Resources Certification is incomplete.

102. The Water Resources Certification has erroneously concluded that the operation of Applicant's proposed

Plant will not violate the standards set for total dissolvable solids in the River. This is because the analysis of Applicant's contribution to total dissolvable solids does not consider Dow Chemical's contribution and Dow Chemical's increased contribution as a result of planned expansion due to, assertedly, low cost energy and process steam from the proposed Plant. Moreover, the discharges of total dissolvable solids by Dow Chemical are downstream from those proposed by Applicant, and, accordingly, the geographic point in the River used as a basis for Applicant's analysis is unrealistic and does not result in a true analysis of the actual amount of total dissolvable solids which are or will be contained in the River.

103. The standard set by the Water Resources Commission with respect to the amount of total dissolvable solids permitted to be discharged in or accumulated in the River is qualitatively unsound in that it does not consider the highly injurious and toxic effect of certain classifications of total dissolvable solids such as the solids resulting from the massive daily discharges by Dow Chemical of chlorinated hydrocarbons. Thus, the standard set for the total dissolvable solids, a standard which permits certain additions to the total dissolvable solids by Applicant as a result of the proposed Plant, is insufficient to protect or upgrade the water quality of the River.

104. The Water Resources Commission has established maximum temperature levels for the River. Intervenors contend that as a result of operation of the proposed Plant and, particularly during a drought year, such as was experienced in 1944-1945, the maximum allowable temperature levels will be exceeded

at points in the River below the Dow Chemical Waste Water Treatment Plant.

105. The Water Resources Commission has used the base year 1975 in its Certification. The use of the year 1975 as a base year has resulted in an inadequate analysis underlying the Certification. This is because subsequent to the year 1975, when Applicant's proposed Plant will be operating, tables of electric power use and projected growth of Dow Chemical indicate that Dow Chemical Company will be discharging substantially more pollutants into the River and, thus, the additive effect of Applicant's discharges will be far greater than has been assumed by the Water Resources Commission. As such, the Water Quality Certification is inadequate.

106. The Water Resources Commission has set a standard for the average content of dissolved oxygen in the River to be not less than five milligrams per liter and in any specific instance, not to be less than four milligrams per liter. Intervenors contend that this standard is insufficient. Moreover, assuming the validity of this standard, it is obvious from an examination of the statistics thus far provided that, currently, the standard is being violated and the additional discharges from the proposed Plant and the resultant expansion of Dow Chemical will inhibit and prevent any ability to meet or maintain the average and specific standard for the River with respect to the dissolved oxygen content.

107. The Water Resources Certification notes major accidents which resulted in adverse effects upon the River, including fish kills on at least two occasions, to wit: on September 14, 1969 and July 27, 1971. The Water Quality Standards set for the River and the

resultant Certification have failed to take into account adverse effects upon the River as a result of accidents of the frequency and severity as those exemplified and described in the Certification. As a result, the Certification and the setting of Water Quality Standards is based upon the unrealistic assumption that the River will only be subjected to the discharges as a result of normal operations. The failure of the Water Resources Commission and its Certification to factor a margin of error for its predictions of discharges into the River including, but not limited to, abnormal discharges, results in the Water Quality Standard being insufficient to protect the River in accordance with law.

108. The Water Resources Commission has established that the coliform count in the River may not exceed 5,000 organisms per milliliter on an average count. There are included within the Water Resources Certification instances of coliform counts which exceed the established standard. Intervenors contend that the total coliform density in the River already exceeds the Water Resources Standards for intolerant warm-water fish and agricultural use during substantial portions of the year and that the operation of Applicant's proposed Plant and any expansion of Dow Chemical will compound these problems by virtue of additional discharges of sanitary wastes which increases the total coliform density.

109. The Water Resources Certification sets forth an established standard governing the River with respect to temperature limits for mixing zones and the edge of mixing zones. However, this Water Quality Standard is inadequate in that the standard does not define the mixing zone absolutely or specifically with respect

to thermal discharges by Applicant or Dow Chemical. As such, the Water Resources Commission Certification represents inadequate protection of the River.

110. The Water Resources Commission has set forth in its Certification Water Quality Standards applicable to the River and other bodies of water for suspended colloids, residues, toxic and deleterious substances, nutrients, phosphates, ammonia, nitrates, sugars, taste and odor and pH. Intervenors contend that discharges from the proposed Plant and from the expansion of Dow Chemical resulting from operation of the proposed Plant will separately and/or in combination cause an increase in total amounts with respect to each of the above areas which will lead to absolute and relative values exceeding the Water Quality Standards and thereby contribute to the degradation of water quality of the River and its confluences.

111. The Regulatory Staff has made no independent review of the Water Resources Certification so as to form an independent judgment upon the Certification or the Water Quality Standards upon which it is based. Accordingly, the Regulatory Staff has failed to meet its obligations pursuant to the National Environmental Policy Act as interpreted by the Calvert Cliffs' decision.

XII

ADVERSE EFFECTS ON WATER USED FOR DOMESTIC PURPOSES AND/OR AGRICULTURAL IRRIGATION

112. Applicant and the Regulatory Staff assert there will be no adverse effect on the domestic water supplies in the greater Tri-City area as a result of the opera-

tion of the proposed Plant. However, neither Appli cant nor the Regulatory Staff has presented and analyzed any data indicating survey of seeps or springs coming into the River. Furthermore, there is no data relating to a recharge of ground reservoirs by the River. The failure of Applicant to have analyzed seeps or springs or recharge or ground reservoirs indicate that Applicant and the Regulatory Staff's assertions with respect to effects, if any, on domestic water supplies are insupportable. Moreover, Intervenors contend affirmatively that based on available statistics that there will be an evaporative lóss from the cooling pond to the River in the range of 20 to 35 cfs which will influence the total recharge of ground water reservoirs which will adversely affect the amout of water available to wells in the Tri-City Region, particularly, downstream from the proposed Plant. Thus, not only have Applicant and the Regulatory Staff failed adequately to analyze these crucial criteria, but the available statistics indicate that operation of the proposed Plant will have an adverse effect upon domestic water supplies.

113. Applicant has admitted that in its franchise area, including the area to be serviced by the proposed Plant, there exists agricultural land which is, from time to time, subject to irrigation. Applicant has not analyzed the effect which the generation of electricity and transmission of electricity from the proposed Plant will have upon the inability of owners of agricultural land to irrigate their crops. Grids and transmission lines will prevent the agricultural land situated near such grids and transmission lines from being irrigated by conventional sprinkler systems. The failure to have considered as a cost to the environment the

amount of agricultural land which will be affected has not been considered in the cost-benefit analysis.

XIII

INADEQUATE ANALYSIS FROM EFFECTS OF MAJOR AND SEVERE FLOODS

114. Applicant and the Regulatory Staff have presented data on a probable maximum flood and assert that the design of the proposed Plant adequately safeguards the Plant from such a probable maximum flood. Intervenors contend, however, that an adequate environmental analysis is not possible unless it includes the probability and effects of a 10-year, 100-year, 500-year, 1,000-year or 10,000-year flood and that the 634 foot site elevation established for the proposed Plant will be insufficient to protect the proposed Plant in most of the above floods. In addition, Applicant's failure to discuss the range of possible floods has resulted in its failure to consider or take into account such a range of floods in connection with the design of the under-structure of the proposed Plant or the emergency measures which would be necessary to be taken into account in the event of such a flood or floods. In any such analysis, Applicant must set forth statistics upon which one can conclude what the degree of probability is with respect to each such flood and must also set forth what the consequences would be from each such flood. Without such information, an adequate cost-benefit analysis cannot be made.

XIV

AREAS IN WHICH THERE IS NO DISCUSSION RESULTING IN AN INCOMPLETE ENVIRONMENTAL ANALYSIS

115. Applicant and the Regulatory Staff have failed to consider in their environmental submissions any information or substantial information in each of the following areas. The failure to have analyzed and considered issues in such areas results in an insufficient environmental analysis of the construction and operation of the proposed Plant:

(a) Social and philosophical effects of the displacement of people as a result of the construction and operation of the proposed Plant;

(b) Wildlife aesthetics;

(c) Population projections;

(d) Chemical explosions at Dow Chemical and Dow Corning Companies;

(e) Effects of synergism between radiation and chemicals;

(f) Effects on fish and other organisms as a result of the operation of intake structures;

(g) Decrease in property values as a result of each cost considered or failed to be considered;

(h) Effects of the construction and operation of transmission lines, including but not limited to, effects in the following areas:
(i) visual aesthetics;
(ii) displacement of land; and
(iii) effects on bird migration.

XV

INADEQUATE COST-BENEFIT ANALYSIS

116. The National Environmental Policy Act requires sufficient information in order to make a cost-benefit analysis both qualitatively and quantitatively. The Regulatory Staff and Applicant have not presented sufficient information and have expressly declined to make qualitative and quantitative analyses of the various costs and benefits discussed in each of their submissions as well as those raised in this Statement of Contentions. Rather, Applicant and the Regulatory Staff have put forward certain value judgments and conclusions without assessing their economic cost or benefit and without relating such value judgments to the standards of the National Environmental Policy Act.

117. In certain instances, Applicant and the Regulatory Staff have provided dollar values but, once again, these dollar values are based upon vague or nonexistent factual support.

118. Intervenors contend that because the procedural failures listed in Contentions 116 and 117, there is a failure to comply with the provisions of the National Environmental Policy Act as well as a failure to provide a sufficient factual basis for this Board adequately to analyze the totality of the environmental impact of the direct and indirect effects of the proposed Plant.

XVI

MISCELLANEOUS

119. Intervenors also incorporate by reference each of the Contentions set forth in Appendix B to our Motions filed on September 30, 1971 and set forth in comments of the Environmental Defense Fund dated June 4, 1971.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,
v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., NEW ENGLAND COALITION ON NUCLEAR POLLUTION AND CONSOLIDATED NATIONAL INTERVENORS, INC.,
Respondents.

BRIEF IN OPPOSITION TO A PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

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BRIEF FOR RESPONDENTS IN OPPOSITION

OPINION BELOW

The opinion of the Court of Appeals (Appendix to the Petition (App.) A-1) is not yet reported.

JURISDICTION

The jurisdictional requisites are adequately set forth in the Petition.

QUESTIONS PRESENTED

1. Does an inadequate record require that a case be remanded to an agency for further proceedings?

2. Does the National Environmental Policy Act of 1969 require federal agencies to consider all reasonably possible environmental impacts, or only a portion of those impacts?

3. May an agency insulate an inadequate record from judicial review by asserting it is exercising its technical expertise?

STATUTES AND REGULATIONS INVOLVED

The pertinent provision of the National Environmental Policy Act of 1969, 42 U.S.C. § 4332, and Section 553 of the Administrative Procedure Act, 5 U.S.C. § 553, are set forth at App. A-258-260 and A-159-160. Section 10(e) of the Administrative Procedure Act, 5 U.S.C. § 706, is set forth in Respondents' Appendix (Resp. App.) A-10.

STATEMENT OF THE CASE

Respondents' statement of the case appears in Respondents' Brief in Opposition filed in No. 76-548.

REASONS FOR NOT GRANTING THE WRIT

This petition and the petition filed in No. 76-548 both refuse to acknowledge the salient fact about the present case: the record compiled by the Atomic Energy Commission (now the Nuclear Regulatory Commission) (the "Commission") in both the generic rulemaking proceeding and in the individual licensing proceeding involved in the present case is flagrantly inadequate. One member

of the hearing board that presided at the rulemaking found that the staff had totally failed to document its assumptions in the court proceedings in contrast to its usual practice. App. A-29-30 n. 48. The majority opinion in the court below summarized the record on the grave potential impacts of reprocessing and disposal of radioactive wastes as consisting of "extremely vague assurances by agency personnel that problems yet unsolved will be solved." App. A-38. And Judge Tamm's concurring opinion condemned the inadequacy of the record, stressing the need to avoid "reckless decisions to mortgage the future for the present, glibly assuring critics that technological advancement can be counted upon to save us from the consequences of our decision." App. A-51.

Indeed neither petition seriously disputes the Commission's failure in either the individual licensing proceeding or the legislative rulemaking to address seriously the environmental hazards posed by the creation of large amounts of radioactive wastes.

Respondents believe, therefore, that even if this Court reviewed the issues raised by petitioners, the case will inevitably have to be remanded to the Commission for further proceedings. Thus little point would be served by review by this Court at the present time. In any event, the issues raised by petitioners were correctly decided by the Court of Appeals and merely represent the application of established principles to the facts of the present case. This case, in sum, presents no occasion for review by this Court.

I. The Procedural Challenges Raised By Petitioner Rest On A Misstatement Of The Holding Below And Ignore The Substantive Basis For The Court Of Appeals Ruling.

Petitioner's major argument focuses on the Court of Appeals' discussion of alternative rulemaking procedures

and attempts to fashion this discussion into the court's holding. Thus Vermont Yankee's petition asserts:

> The Court of Appeals . . . held that the rulemaking proceeding which the Commission had on the subject was procedurally—not substantively—defective . . . .

Pet. 12.

> Nevertheless, the court held that the Commission's rulemaking proceeding insufficiently "ventilated" the issues. There is, however, no basis in law for the imposition of special procedures to achieve such a goal.

Pet. 13.

Respondents believe that this characterization of the Court of Appeals' decision misstates the basis for the holding of the court below. Contrary to petitioner's assertion, the Court of Appeals clearly held that the substantive record compiled by the Commission was woefully inadequate to sustain the rule finally adopted by the Commission. App. A-23 to A-38. And even more plainly, the court did not hold that special procedures had to be adopted for their own sake. Rather the court tied its discussion of procedure directly to the Commission's failure to generate an adequate record:

> We do not presume to intrude on the agency's province by dictating to it which, if any, of these devices it must adopt to flesh out the record. . . . Whatever techniques the Commission adopts, before it promulgates a rule limiting further consideration of waste disposal and reprocessing issues, it must in one way or another generate a record in which the factual issues are fully developed.

App. A-40 to A-41.

Respondents' full discussion of petitioner's procedural challenges to the holding below appears in Respondents' Brief in Opposition in No. 76-548.[1]

II. The Decision Below Does Not Address The Timing Of The Preparation Of An Impact Statement And Is Completely Consistent With The Decision In *Kleppe* v. *Sierra Club*.

The petitioner's contention that the Court of Appeals' holding conflicts with *Kleppe* v. *Sierra Club*, —— U.S. ——, 42 U.S.L.W. 5104 (June 28, 1976) is unsupportable. It is not altogether clear precisely how petitioner claims the decision below is inconsistent with *Kleppe*. The Petition faults the Court of Appeals' decision because the Court of Appeals "held that the Commission may not confine itself to the environmental effects of the proposal before it (i.e., the licensing of a single generating plant) but must consider the environmental effects of the entire fuel cycle." Pet. 16. But the basic issue in *Kleppe* was whether the Interior Department had a plan or proposal for regional development of the Northern Great Plains Region that required the preparation of an environmental impact statement on such a regional plan. Based on the record in that case, this Court held that the Interior Department was not considering such a plan or proposal. 44 U.S.L.W., at 5107. Therefore, in

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[1] In its Supplemental Brief, petitioner emphasizes that the Court of Appeals amended its opinion to remove reference to "the only specific procedural criticism which it made of the agency record." Petitioner's Supp. Brief, at 4. Petitioners choose to ignore, of course, that the correction was essentially trivial. The record reflects that the Hearing Board asked the Commission's only witness on waste disposal a few *pro forma* questions, Resp. App. A-1, instead of no questions, as the court's opinion originally stated. But the fault the court found with Commission's proceedings was that the record produced was inadequate, not that the Commission committed one particular procedural sin. The court's view of the record could not be affected by the presence or absence of the few questions involved in the correction of the court's opinion.

Kleppe, this Court held there was no proposed major federal action which required the preparation of an environmental impact statement pursuant to NEPA. Moreover, the Court noted that it was inappropriate for a court to intrude "on the germination process of a potential proposal" and to set the time when an EIS should be prepared. 44 U.S.L.W., at 5108.

In this case there is no question that the Commission proposed to issue an operating license for the Vermont Yankee nuclear power reactor. There is no quarrel about *what* proposed action the EIS should analyze or even *when* an impact statement should be prepared. Accordingly, *Kleppe* is not related to the issues raised by this case.

Petitioner's alleged conflict with *Kleppe* is in fact simply an argument that the Court of Appeals required the Commission to assess environmental effects which the petitioner believes should not be considered. The court below applied the unexceptionable principle that an agency's Environmental Impact Statement must weigh the direct, nonspeculative environmental consequences of a specific proposed action before the agency may proceed. *Aberdeen & Rockfish R. Co.* v. *SCRAP*, 422 U.S. 289 (1975); *Calvert Cliffs Coordinating Committee* v. *AEC*, 449 F.2d 1109, 1114 (D.C. Cir. 1972); *Indian Lookout Alliance* v. *Volpe*, 484 F.2d 11 (8th Cir. 1973). That some of the environmental consequences of a proposed action may be separated by space or time from the proposed action is irrelevant to a determination of the scope of the impacts to be considered in the statement. As *Kleppe* itself noted, NEPA requires a "detailed" impact statement that evaluates the full environmental consequences of proposed actions. 44 U.S.L.W., at 5109. *See also Scientists' Institute for Public Information, Inc.* v. *AEC*, 481 F.2d 1079 (D.C. Cir. 1973); *Natural Resources*

Defense Council, Inc. v. *Morton*, 458 F.2d 827 (D.C. Cir. 1973).

The issue is simply one of completeness. An impact statement must analyze all potential environmental impacts of a proposed development, not just a portion of these impacts. During its operation, a nuclear reactor will inevitably generate radioactive wastes. These wastes must be managed and disposed of, and these activities will cause significant environmental impacts. In fact, these wastes represent possibly the major environmental problem posed by nuclear power. The Court of Appeals held that an environmental impact statement on a proposal to issue an operating license to a nuclear power reactor must consider these potentially severe impacts before operation of the reactor is approved.[2] To do otherwise requires court and agency to blind themselves to these potentially major impacts. Respondents believe the decision of the court below was plainly correct. Moreover, the issue involved hardly deserves review in this Court. The environmental effects that should be included

[2] The Court of Appeals put the issue well:

> The real question posed by the Board's opinion is whether the environmental effects of the wastes produced by a nuclear reactor may be ignored in deciding whether to build it because they will later be considered when a plant is proposed to deal with them. To answer this question any way but in the negative would be to misconstrue the fundamental purpose of NEPA. Once a series of reactors is operating, it is too late to consider whether the wastes they generate should have been produced, no matter how costly and impractical reprocessing and waste disposal turn out to be; all that remain are engineering details to make the best of the situation which has been created. NEPA's purpose was to break the cycle of such incremental decision-making . . . . Decisions to license nuclear reactors which generate large amounts of toxic wastes requiring special isolation from the environment for several centuries are a paradigm of "irreversible and irretrievable commitments of resources" which must receive "detailed" analysis under § 102(2)(C)(v) of NEPA, 42 U.S.C. § 4332(2)(C)(v). App. A-11 to A-12.

in an environmental impact statement are highly dependent upon the facts and circumstances of the particular project in question. This analysis hardly involves a legal question that merits the attention of this Court.

Petitioner also argues that "the unique history of congressional regulation and oversight in the nuclear field," Pet. 16-17, should exempt from analysis under NEPA the potential environmental impacts of radioactive wastes. Respondents believe this contention is frivolous. NEPA was enacted to require federal agencies to take environmental effects into consideration in their decisionmaking as well as to ensure that the Congress and the President receive information on potential environmental impacts. If the passage of a statute sanctioning particular activities by the federal government was itself read as an indication that Congress intended no review of environmental consequences of these activities, NEPA would apply to nothing. NEPA requires all agencies to address environmental concerns in their decisionmaking. The Court of Appeals has simply applied that directive in the present case to the Commission's licensing of nuclear reactors. There is nothing remarkable about this holding, and it is not a question deserving the attention of this Court.

III. The Court Of Appeals Properly Reviewed The Administrative Record And Found It Adequate.

Petitioner argues that the court below improperly disregarded the technical judgment of the Agency. But technical judgment must rest on an adequate record. This Court has recognized that review of agency action under the arbitrary and capricious standard of Section 10(e) of the Administrative Procedure Act, 5 U.S.C. § 706, requires an "inquiry into the facts [which] is to be searching and careful." *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402, 415 (1971). Moreover,

Overton Park made clear that the presumption of regularity and an agency's expertise are "not to shield [its] action from a thorough, probing, in-depth review" to determine "whether the decision was based on a consideration of the relevant factors." *Id.*, at 416. Moreover, this Court has also repeatedly pointed out that

> [D]ue deference is to be rendered to agency determinations of fact, *so long as* there is substantial evidence to be found in the record as a whole.

NLRB v. *Brown*, 380 U.S. 278, 291-92 (1965) (emphasis added).

But such deference plainly is irrelevant if under either the substantial evidence test or the arbitrary and capricious standard, the record is inadequate to sustain the agency's action. In short, agency action cannot be shielded from judicial review simply by an incantation of a talismanic phrase. If no evidence exists in the record to support a particular conclusion, the agency's action cannot stand no matter how expert the decisionmaker.

Petitioner's argument, therefore, is aimed at the wrong target, since the Court of Appeals set out at such great length the inadequacies the court saw in the record. The Court of Appeals established in painstaking detail the Commission's statements for which no support existed in the record. In addition, the court canvassed the statements of the only staff witness to discuss the issue of waste disposal, carefully identifying assertion after assertion that either had no support in the record or raised questions without answering them. *See* App. A-23 to A-38.

The court noted that one member of the Commission hearing board had acknowledged that the record in the

present proceeding was woefully deficient in contrast to other Commission proceedings and normal Commission practice:

> [o]ne of the, I think, outstanding practices of the Staff has been in the past, at least as far as I can tell, to meticulously document the assumptions that are made in the discussions. I find that that has not been done here. . . .

App. A-29-30 n. 48.

Petitioner appears to contend that an agency may insulate an inadequate factual record from judicial review by a claim that the agency is exercising "technical judgment." This argument might suggest that federal agencies no longer need adequate records on which to base their decisions. The real basis for petitioner's argument, however, appears at page 19 of its petition when petitioner implies, but certainly attempts no demonstration, that the Court of Appeals' conclusion about the adequacy of the record was incorrect.

Petitioner's reluctance to attack the Court of Appeals' conclusion that the Commission's record was inadequate is understandable on two grounds. First, that conclusion is in fact unassailable. Second, the question whether the record before the Commission was adequate is hardly an issue of sufficient import to justify review in this Court.

The Commission devoted one and a half days to the hearings investigating the potential environmental impact of waste disposal—possibly the major environmental hazard posed by nuclear power. The record it made consisted of unsupported and vague assurances by one witness, despite major uncertainties and problems reflected in the record. And as petitioner points out, Pet. 19, the Court of Appeals noted in its opinion that subsequent events have already made a mockery of many assertions in the testimony of one witness that is in the record.

App. A-27 n. 46, A-33, n. 51, 52. There is simply no question here of the exercise of "technical judgment." What the Court of Appeals held was that no factual record existed on which to base technical judgment, and the Court of Appeals' extended analysis, App. A-23 to A-38, demonstrates the correctness of that conclusion.

Therefore, what the petitioner is actually asking this Court to do is to review the record of the Commission's proceeding and determine whether it was in fact adequate. Respondents respectfully submit that review of the Court of Appeals' decision on this question—particularly when the analysis of the lower court is so plainly correct—is simply not an issue deserving the attention of this Court.

CONCLUSION

For the reasons set out above and in Respondent's Brief in Opposition in No. 76-548, the Petition for a Writ of Certiorari filed in this case should be denied.

Respectfully submitted,

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SUPREME COURT, U. S.
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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

Nos. 76-419 & 76-548

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., NEW ENGLAND COALITION ON NUCLEAR POLLUTION, and CONSOLIDATED NATIONAL INTERVENORS, INC.,
Respondents

BALTIMORE GAS & ELECTRIC COMPANY, et al.,
Petitioners

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC. and CONSOLIDATED NATIONAL INTERVENORS, INC.,
Respondents

COMBINED APPENDIX TO BRIEFS IN OPPOSITION TO PETITIONS FOR WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

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UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

IN THE MATTER OF: URANIUM FUEL CYCLE	Docket No. RM-50-3

New Executive Office Building
Room G2008
17th & H Streets
Washington, D.C.

Thursday, 1 February 1973

The above-entitled matter came on for hearing pursuant to notice, at 10 a.m.

BEFORE:

M. D. PAGLIN, ESQ., Chairman.
DR. JOHN C. GEYER, Member.
DR. M. J. STEINDLER, Member.

APPEARANCES:

(As heretofore noted.)

ADDITIONAL APPEARANCES:

ARVIN E. UPTON, ESQ. and JAMES P. MCGRANERY, JR., ESQ., Lebauf, [*sic*] Lamb, Leeby [*sic*] & MacRae, 1821 Jefferson Place, N.W., Washington, D.C., on behalf of Alabama Power Company, et al.

AFTERNOON SESSION

2:00 P.M.

CHAIRMAN PAGLIN: Will the proceeding come to order? The Board has determined and with the kind

cooperation of Mr. Roisman, in order to accommodate Dr. Pittman, we would like to put some Board questioning to Dr. Pittman at this stage and then we will recommence with Mr. Roisman's group.

So the Board Members have questions of Dr. Pittman at this time. Dr. Steindler?

DR. STEINDLER: There has been some discussion and you alluded to it in your testimony regarding our present ability, the present ability of the nuclear industry to retain high level wastes in a safe fashion. Is there anything that your studies have shown that indicates that at this point, as apparently practiced in the industry, the retention of high level wastes is a real problem?

DR. PITTMAN: There is nothing that I can see with regard to the commercial high level wastes, either from the point of view of what the industry will have to do under the regulatory scheme, or what the AEC will have to do, once the solidified waste is delivered to them, to us.

The possible retention for up to five years in stainless steel tanks, as an acid solution is the type of thing we have had at Idaho Falls for of the order of ten years, and the type of thing we have been doing in stainless steel tanks at Idaho Falls for ten years, retention in acid solutions with no problems at all.

The next step the industry has to carry out is if they decide to wait five years and retain it as acid solution, to solidify the material, there are several methods of solidification, the method that was chosen by the first company who is going into business this year is that of using the fluid bed calcination technique, which again is one that has been demonstrated at Idaho Falls for ten years, and they then put that into cannisters and store it in basins of water.

All of this is under the license control of the regulatory group. The basin storage is similar to the type of

storage that is used at reactors for storing spent fuel elements that have essentially the same fission product contents, they have a lot more, has more plutonium than uranium, so it has a problem of material that we don't have in the wastes.

The sealing by ten feet steel cannisters is certainly no breakthrough in technology, it is something that can be done and has been done in many industries for a long period of time. The transportation of the spent wastes in the casks of the same type that have been used to transport spent fuel in my opinion is a demonstrated technology.

And the engineered surface storage of these wastes once delivered to the Commission is purely an engineering application of technologies that have been known for many years and that have been used by the Commission in not waste storage, because in our previous systems we used other methods, but in my opinion there is no technology that needs to be developed in order for the whole storage of wastes from the time it is generated and it is kept in manageable sized containers, from that point on, to the time we get it and store it in the engineered storage in managably sized retrievable, monitorable, maintainable containers.

The engineered storage, you have heard the words, we have designed for one hundred years, that is purely meant to show that the basic basins, the facilities in which these materials will be received and stored, are built with the latest technology for concrete and steel, and will certainly last a hundred years, probably a lot longer with adequate maintenance of the facilities.

We do not necessarily expect a given cannister delivered to us in 1983 to not have some corrosion problems in one hundred years. They can quite easily be overcanned or recanned or maintained and we have techniques built into the engineered storage facility that will allow us to detect when there is a leak before it

becomes a major leak, and to identify which tank is leaking, to take it out and repair it or repackage it.

DR. STEINDLER: Then the picture that I think I am beginning to see here is that at the moment it appears that the high level wastes are retainable in the individual reprocessing facilities, and that the engineered storage area will consolidate the waste surveillance and handling problem into one site and that is really its major contribution, not the development of some new technology.

DR. PITTMAN: There is nothing new being developed in the engineered storage facility. We are looking at better techniques of removing the heat, more efficient techniques of removing the heat than maybe used before. But it is purely an engineering application of known technology we are using.

And the idea of bringing these together at one site under the auspices of one agency, namely the Atomic Energy Commission, has to do more with the assurance of continued control for whatever period of time is necessary.

DR. STEINDLER: Thank you.

CHAIRMAN PAGLIN: Dr. Geyer?

DR. GEYER: Dr. Pittman, I refer to Table H-1 on page H-3 of the Survey Report.

DR. PITTMAN: Yes, sir.

DR. GEYER: There appears there numbers of shipments per model LWR annual fuel requirement. The question is will these remain constant with time over the years?

DR. PITTMAN: Per annual fuel requirement as it is now known, they will remain constant for the waste.

There are several factors which might make it fewer shipments, because we are assuming that the waste material in the can, has a very low density, and we can only get the equivalents of 3 tons of fuel reprocessed, the waste from three tons, into a can.

We have under development methods of solidification which might cut that down by a factor of 3 or more in the amount of wastes that you can get into a can. If it makes any sense. We feel that the packaging and shipping and storage of the low density material that is being produced by the first reprocessors going into business is perfectly safe, but there may be some economics in being able to get more of this material into a given can, which would cut down on the number of shipments, per year, per reactor.

DR. GEYER: I assume then that one could make an estimate of the number of model LWR's or the equivalents of them that would be present 30 years from now, and that would be the number of, multiplied by one, would be the number of shipments of high level wastes?

DR. PITTMAN: I don't have the figures in my head for the number of shipments we are assuming will have to take place per year from the economy and, the nuclear economy in the year 2000. I do remember a figure, I will be glad to submit a corrected figure for the record, but I do remember a figure that in the year 2000 there will be 8,000 cans delivered during that year, if I remember the figure correctly. In other words, the slope is going up very rapidly towards the end of the century.

DR. GEYER: But it would be desirable to have in the record some of the long term estimates, just to see what the scope of this problem may be in the future.

DR. PITTMAN: This would be for the entire economy?

DR. GEYER: That is right.

DR. PITTMAN: We have the figures. I can get them for the record.

DR. GEYER: It would be nice to have them for say 25 and 50 years, just to see what they might look like.

DR. PITTMAN: Yes, what we are assuming is this one facility we build will handle everything generated

through its end of the century. And then there would have to be more facilities, maybe expansion of this one, maybe new facilities or maybe other techniques would be used by that time.

DR. GEYER: My next question bears on the same problem in a sense. There will certainly be a considerable amount of this material in transit and since the cell storage under water of the high level waste is apparently being considered to be an interim measure, to be subsequently replaced by permanent resolution of the storage problem, why not leave the wastes where they are?

DR. PITTMAN: This is one of the things that is being given consideration, not so much from the standpoint of leaving them where they are in the basins of the reprocessor, but rather in the selection of sites.

One of the factors we are looking at in the selection of sites is does it make sense for us to have several government owned and operated repositories, right adjacent to or near the location of the reprocessing plants, so the initial shipment of this waste while it is at its hotest, namely after ten years, would be minimized?

DR. GEYER: Why not right on the site?

DR. PITTMAN: It is possible right on the site, under government control. We are still assuming government control is necessary. This is being looked at and evaluated against a single repository. The early indications seem to give the economics in favor of one single repository versus a series of small ones, but that is only economics.

DR. GEYER: Thank you, sir. That is all.

CHAIRMAN PAGLIN: Thank you very much, Dr. Pittman.

DR. PITTMAN: Thank you, sir.

National Environmental Policy Act § 102

5 U.S.C. § 4332

§ 4332. Cooperation of agencies; reports; availability of information; recommendations; international and national coordination of efforts

The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this chapter, and (2) all agencies of the Federal Government shall—

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by subchapter II of this chapter, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of Title 5, and shall accompany the proposal through the existing agency review processes;

(D) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(E) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(F) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(G) initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(H) assist the Council on Environmental Quality established by subchapter II of this chapter.

Administrative Procedure Act § 10(e)

5 U.S.C. § 706

§ 706. Scope of review

To the extent necessary to decision and when presented, the reviewing court shall decide all relevant questions of law, interpret constitutional and statutory provisions, and determine the meaning or applicability of the terms of an agency action. The reviewing court shall—

(1) compel agency action unlawfully withheld or unreasonably delayed; and

(2) hold unlawful and set aside agency action, findings, and conclusions found to be—

(A) arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law;

(B) contrary to constitutional right, power, privilege, or immunity;

(C) in excess of statutory jurisdiction, authority, or limitations, or short of statutory right;

(D) without observance of procedure required by law;

(E) unsupported by substantial evidence in a case subject to sections 556 and 557 of this title or otherwise reviewed on the record of an agency hearing provided by statute; or

(F) unwarranted by the facts to the extent that the facts are subject to trial de novo by the reviewing court.

In making the foregoing determinations, the court shall review the whole record or those parts of it cited by a party, and due account shall be taken of the rule of prejudicial error.

Nos. 76-419, 76-528, 76-548, AND 76-745

Supreme Court, U. S.
FILED
JAN 10 1977
MICHAEL RODAK, JR., CLERK

In the Supreme Court of the United States

OCTOBER TERM, 1976

VERMONT YANKEE NUCLEAR POWER CORPORATION,
PETITIONER
v.
NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.

CONSUMERS POWER COMPANY, PETITIONER
v.
NELSON AESCHLIMAN, ET AL.

BALTIMORE GAS AND ELECTRIC CO., ET AL.,
PETITIONERS
v.
NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.

LONG ISLAND LIGHTING COMPANY, PETITIONER
v.
THE LLOYD HARBOR STUDY GROUP, INC.

ON PETITIONS FOR WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

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In the Supreme Court of the United States

OCTOBER TERM, 1976

NO. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION, PETITIONER

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.

NO. 76-528

CONSUMERS POWER COMPANY, PETITIONER

v.

NELSON AESCHLIMAN, ET AL.

NO. 76-548

BALTIMORE GAS AND ELECTRIC CO., ET AL., PETITIONERS

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.

NO. 76-745

LONG ISLAND LIGHTING COMPANY, PETITIONER

v.

THE LLOYD HARBOR STUDY GROUP, INC.

ON PETITIONS FOR WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF FOR THE FEDERAL RESPONDENTS

The United States and the United States Nuclear Regulatory Commission (the Commission)[1] file this joint brief to apprise the Court of their views on four related

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[1]The Nuclear Regulatory Commission has succeeded to the licensing and related regulatory functions of the Atomic Energy Commission in accordance with the Energy Reorganization Act of 1974, Pub. L. 93-438, 88 Stat. 1233, 42 U.S.C. (Supp. V) 5801 *et seq.*

petitions for writs of certiorari sought by affected parties from judgments entered July 21, 1976, and an order issued November 9, 1976, by the United States Court of Appeals for the District of Columbia Circuit. The federal respondents agree that the decisions of the court of appeals are in error; they disagree over whether the decisions contain any error of sufficient significance to warrant review by this Court. The Commission believes that the issue urged by petitioners regarding the procedures to be followed by the Commission upon a directed remand is appropriately presented, and consequently urges that the petitions sought in these proceedings be granted. The United States believes that this procedural issue is not appropriately presented in these cases; for that reason, and because the other questions presented do not independently have sufficient importance to warrant the exercise of this Court's jurisdiction, the United States believes the petitions should be denied.

QUESTIONS PRESENTED

1. Whether rulemaking proceedings governed by and fully complying with 5 U.S.C. 553 of the Administrative Procedure Act were nevertheless procedurally defective for failure to employ unspecified hybrid procedures to further "ventilate" the issues. (The Commission agrees with petitioners that this issue is properly presented in these cases; the United States disagrees.)

2. Whether the National Environmental Policy Act requires the reopening of an agency proceeding to assess new information bearing on "alternatives," where the alternatives were neither obviously central to the agency decision nor clearly identified as issues in the agency hearing.

3. Whether judicial relief is appropriate for the failure of the Commission's licensing board, *sua sponte*, to have returned the report of its Advisory Committee on Reactor Safeguards concerning the proposed Consumers Power nuclear plant for further clarification.

STATEMENT

These cases arise out of the Nuclear Regulatory Commisson's method of considering certain anticipated environmental effects of the nuclear fuel cycle when it decides whether to issue construction permits and operating licenses for nuclear power reactors. The environmental effects are those from nuclear fuel reprocessing and waste management incidental to such reactors.[2] The essential facts can be briefly stated.

The Commission promulgated regulations assigning specific quantitative values to the environmental effects attributable to various operations associated with an individual reactor—including fuel reprocessing and waste management (10 C.F.R. 51.20(e)). It did so after making public an extensive environmental survey analyzing the whole of the fuel cycle, publishing a proposed rule, conducting oral hearings before an expert panel and entertaining written and oral argument before the Commission. The table of values ("Table S-3") promulgated as part of this rule was to be included in the environmental report required of each applicant for a license to construct or operate a nuclear power reactor, and in the Commission's environmental impact statement for each reactor license required by the National Environmental Policy Act of 1969 (NEPA) (83 Stat. 852, 42 U.S.C. 4321 *et seq.*) without being subject to further dispute. 10 C.F.R. 51.20(e), 51.21, 51.23(a), 51.26(a).

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[2] "Fuel reprocessing" refers to the treatment of spent fuel to recover fuel material for possible later use. "Waste management" concerns the handling and ultimate disposal of waste material resulting from operation of nuclear facilities. Other stages in the fuel cycle include mining, enrichment, fuel fabrication, reactor operation, and spent fuel storage.

In the first opinion ("*Vermont Yankee*"), which is the subject of the petitions in Nos. 76-419 and 76-548,[3] the court of appeals concluded that the rulemaking proceedings underlying the promulgation of these regulations were inadequate insofar as they concerned fuel reprocessing and waste management, and accordingly remanded both the Commission order granting an operating license for the Vermont Yankee nuclear power plant and the regulations at issue to the Commission for further consideration of the environmental effects of these aspects (Pet. No. 76-419, App. A-13, A-44).

In the opinion ("*Consumers Power*") that is the subject of the petition in No. 76-528, the court remanded the Commission's decision granting a permit to Consumers Power to construct two nuclear reactors (the Midland reactors)[4] citing its decision in *Vermont Yankee* as well as the Commission's failure to consider explicitly in its environmental impact statement whether energy conservation would obviate the need for the reactors (Pet. No. 76-528, App. 5-16). The Commission was directed to account for all intervening developments in its reanalysis of the energy conservation issue. With respect to another

[3]The Vermont Yankee and Consumers Power proceedings were conducted before the promulgation of the contested regulation. The Commission decided in the Vermont Yankee licensing proceeding that environmental questions relating to fuel reprocessing and waste management should not be considered in individual licensing proceedings. That view was subsequently modified, and the challenged regulation was adopted to facilitate the consideration of such issues in subsequent proceedings (Pet. No. 76-419, App. A-3 to A-6). Because the incremental environmental effects so identified were insignificant, the Commission concluded that it was unnecessary to reopen decided cases (Pet. No. 76-528, App. 331-332, 335).

[4]The extensive agency consideration that preceded issuance of this permit is summarized in Pet. No. 76-528 at pp. 3-6.

question—the clarity of the statutorily required reports of the Advisory Committee on Reactor Safeguards (ACRS) on the possible hazards of the proposed facility—the court faulted the Commission's hearing panel for having failed spontaneously to return the reports to the ACRS for amplification. The court directed that on remand the ACRS report on the Midland reactors should be returned "for clarification," the implication being that the Consumers Power hearings may then have to be reopened to take account of the clarified ACRS views (Pet. No. 76-528, App. 16-21).

Finally, in the decision that is the subject of the petition in No. 76-745, the court remanded the Commission's decision granting a permit to the Long Island Lighting Company to construct a nuclear power reactor to the Commission for further consideration of the environmental effects of fuel reprocessing and waste management. It relied without discussion on its decisions in *Vermont Yankee* and *Consumers Power* (Pet. No. 76-745, App. 1-2).

DISCUSSION

1. The federal respondents agree that the issue concerning the adequacy of the Commission's rulemaking procedures is the major issue presented by these petitions. However, the *Vermont Yankee* opinion, in which this issue is discussed, is subject to varying interpretations.

Petitioners and the Commission read the opinion as holding that the Commission's rulemaking proceeding, though in compliance with applicable statutory procedural requirements (5 U.S.C. 553; see 42 U.S.C. 2239(a)), was nevertheless procedurally defective. Aside from the court's insistence that additional procedures provide for "ventilation" of the issues and "dialogue" between the agency and interested parties, the opinion gives no guidance regarding the precise nature of the procedures to be

employed. Although the court also refers to asserted inadequacies of the record,[5] separate opinions by Judges Bazelon and Tamm underscore the majority's emphasis on asserted procedural deficiencies, leading the Commission to the reading also given by petitioner Vermont Yankee. The interpretation is one of which counsel advising federal agencies subject to judicial review under 28 U.S.C. 2342 and 2343 must take account. Under the decision, the Commission must be advised that in the remanded proceedings the use of procedures exceeding the minimum requirements of 5 U.S.C. 553 is no longer a matter of sound agency discretion but has become a matter of forced compliance with the vaguely articulated preference of the Court of Appeals for the District of Columbia Circuit.[6] So

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[5]Petitioners in No. 76-548 note as their second question for review the court's failure to offer any explanation for the conclusion that the rulemaking record on fuel reprocessing (as distinct from waste management) is inadequate. The federal respondents agree that whatever grounds the decision may fairly have identified for finding insufficient the record's 20-page statement on high-level waste management, they do not carry over to the reprocessing issue, on which the Commission had before it a 40-page section from the staff study (The Environmental Survey of the Nuclear Fuel Cycle), more than 25 pages of additional relevant testimony, and extensive comments on the environmental effects of reprocessing. See Pet. No. 76-548, p. 15, n. 14. Without explanation of its error or insufficiencies, the agency is left in confusion regarding the direction its action on remand should follow to prepare a record on fuel reprocessing that might survive subsequent judicial review. While this particular failure of the appellate function may not alone have an importance warranting Supreme Court intervention, it deserves correction, should the Court decide to review the decision below.

[6]The Commission has announced its intention to consider adoption of a rule for an interim eighteen-month period using notice-and-comment procedures, while an effort is made to develop a permanent rule using the more elaborate procedures the court of appeals has required. The proposed interim rule was published for public comment together with a related survey and impact analysis explaining the basis for the revised regulation, and the serious effects of a licensing moratorium. See Pet. No. 76-419, Supp. App. SA-5 to SA-24. The

interpreted, the *Vermont Yankee* opinion conflicts sharply with applicable decisions of this Court holding that the notice-and-comment procedures of 5 U.S.C. 553 suffice to meet the "hearing" requirement. *See United States* v. *Florida East Coast Railway Co.*, 410 U.S. 224, 241, and *United States* v. *Allegheny-Ludlum Steel Corp.*, 406 U.S. 742, 758. See also Friendly, "*Some Kind of Hearing*," 123 U. Pa. L. Rev. 1267, 1307 (1975). The opinion also conflicts with decisions in other circuits.[7] As has been demonstrated

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Commission believes that these notice-and-comment procedures satisfy Section 553. Moreover, even assuming the court of appeals correctly required more elaborate procedures for the promulgation of a permanent rule, the Commission believes the statutory notice-and-comment procedures are warranted for the interim rule by analogy to the emergency rulemaking provisions of 5 U.S.C. 553(a)(3)(B).

The Commission expects to decide shortly whether to adopt the proposed rule on an interim basis (*id.* at S-21, n. *). However, the Commission believes the APA entitles it to use such procedures, if it chooses, without need for special demonstrations, rules of limited duration, or subsequent use of more elaborate procedures.

[7]The Fifth, Ninth and Tenth Circuits, in disagreement with the D.C. Circuit, seem to deem notice-and-comment sufficient for informal rulemaking. See *General Telephone Company of Southwest* v. *United States*, 449 F. 2d 846, 862-863 (C.A. 5); *California Citizens Bank Association* v. *United States*, 375 F. 2d 43, 50 (C.A. 9), certiorari denied, 389 U.S. 844; and *Phillips Petroleum Company* v. *Federal Power Commission*, 475 F. 2d 842, 852 (C.A. 10), certiorari denied *sub nom. Chevron Oil Company* v. *Federal Power Commission*, 414 U.S. 1146. The Second and Fourth Circuits are aligned with the D.C. Circuit. See *Natural Resources Defense Council* v. *U.S. Nuclear Regulatory Commission* 539 F.2d 824 (C.A. 2), petition for certiorari pending on other issues *sub nom. Allied General Nuclear Services* v. *Natural Resources Defense Council*, No. 76-653; *Appalachian Power Company* v. *Environmental Protection Agency*, 477 F. 2d 495, 503 (C.A. 4). The First, Third, and Sixth Circuits seem ambivalent. *Law Motor Freight, Inc.* v. *Civil Aeronautics Board*, 364 F. 2d 139, 144 (C.A. 1); *Duquesne Light Company* v. *Environmental Protection Agency*, 481 F. 2d 1, 6-7 (C.A. 3); *Buckeye Power, Inc.* v. *Environmental Protection Agency*, 481 F. 2d 162, 170-172 (C.A. 6); *Upjohn Company* v. *Finch*, 422 F. 2d 944, 955 (C.A. 6).

quite recently, when Congress desires to require the use of hybrid rulemaking procedures it can do so specifically. See Section 6(c) of the Toxic Substances Control Act, Pub. L 94-469, 90 Stat. 2020-2023 (October 11, 1976).

The procedural question is of great significance to Commission functioning, since uncertainty concerning the ground rules of informal rulemaking will operate to "chill" the Commission's exercise of discretion in shaping procedures to provide the most effective rulemaking. In the Commission's view, the court's erroneous procedural discussion will give its mandate, once issued,[8] an effect of wrongful compulsion to conform Commission rulemaking procedures to unarticulated standards of the United States Court of Appeals for the District of Columbia Circuit, subject to the threat that licensing activities may be suspended for failure correctly to assess that court's intent. Especially where procedural error results in the setting aside of Commission action, the intrusion on agency procedural discretion exemplified by the *Vermont Yankee* opinion may well cause serious loss of the informal rulemaking flexibility intended by the Administrative Procedure Act and supported by this Court in *Florida East Coast Railway Co., supra,* 410 U.S. at 241. The Commission is entitled to be free of the coercive restraint on its lawful discretion which it perceives in the lower court's decision and which in its view

[8]On October 8, 1976, the court of appeals stayed its mandate in the *Vermont Yankee* case indicating that the Commission could continue licensing activities "on condition that * * * any licenses granted between July 21, 1976 and such time when the mandate is issued [shall be] subject to the outcome of the proceedings herein." Pet. No. 76-419, Supp. App. SA-3 to SA-4. Pursuant to Fed. R. App. P. 41(b), the mandate now is stayed pending Supreme Court action on the petitions for certiorari. The Commission's interpretation of the stay of mandate has been sharply challenged in the court of appeals by the non-federal respondents.

can only be relieved by Supreme Court review and modification of that decision. Review at a later point will not be sufficient, in the Commission's view, since in the interim the Commission will have been compelled to employ unnecessarily elaborate procedures, causing costly delay and perhaps an irreparable hiatus in development of an important national energy source. Thus the procedural issue identified by all petitioners clearly has both a legal and a practical significance warranting review.

The United States' disagreement with the Commission is in regard to whether this administrative law issue is presented in these cases. The United States believes that the court in *Vermont Yankee* held unanimously that the record in the particular rulemaking proceeding at issue was inadequate to support the rule promulgated. Pet. No. 76-419, App. A-25 to A-34, A-38 to A-41 and n. 60; A-51 to A-53 (concurring opinion). Judge Tamm's concurring opinion reflects his concern that "[t]he majority appears to require the Commission to institute further procedures of a more adversarial nature," although in Judge Tamm's view, "the deficiency is not with the *type* of proceeding below, but with the completeness of the record generated" (*id.* at A-52 to A-53). But, as Judge Tamm notes (*id.* at A-53, n. 4), the majority itself recognizes that "the procedures the agency adopted in this case, if administered in a more sensitive, deliberate manner, might suffice" (*id.* at A-40).

The United States therefore believes that the most reasonable reading of the opinion below is that it remands the case to the Commission with directions to supplement the record, leaving the manner in which that is to be done to the agency's discretion. The discussion in the majority opinion (*id.* at A-40) concerning the many procedural devices available for further developing the record—specifically including the "more sensitive" use of the procedures previously used—is simply dicta, which at most

indicates the kind of agency review the court is likely to find adequate if the Commission's decision on remand is challenged in a later case. Based on this interpretation of the *Vermont Yankee* opinion as turning on the adequacy of the evidence in a particular rulemaking proceeding to support the agency's action, the United States submits that the decision presents no general administrative law question that warrants this Court's review.

In any event, the United States believes that review by this Court of the procedural issues submitted by petitioners would be premature. On remand, the Commission can supplement the record in whatever manner it deems appropriate. If the non-federal respondents challenge the new regulation, the court of appeals may then be required to decide specifically whether the agency procedures used on remand were adequate. If this Court is asked to review a decision on that ground, the procedural issue now presented by petitioners will be ripe for review. Cf. *United States* v. *Florida East Coast Railway Co.*, 410 U.S. 224, 241; *United States* v. *Allegheny-Ludlum Steel Corp.*, 406 U.S. 742, 758. In contrast, in the present posture of these cases, the procedural issue is not directly presented, since the court below found that the agency record was substantively inadequate. Under those circumstances, the only proper course was a remand for further proceedings. It would be no more appropriate for this Court than for the court of appeals to prescribe the methods and procedures to be used in the agency's supplemental inquiry. See *Federal Power Commission* v. *Transcontinental Gas Pipe Line Corp.*, 423 U.S. 326, 333.[9]

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[9]The Commission, however, does not view the relief it is seeking as calling on this Court to prescribe the procedures to be used in the supplemental inquiry. As noted above, the relief it seeks is freedom from the cloud case on its discretion by the court of appeals' decision.

2. The petitioner in No. 76-528 suggests that the court of appeals erred in holding that the Commission had inadequately considered energy conservation as an alternative to the proposed Midland nuclear facilities (Pet. No. 76-528, pp. 17-20). The court concluded that, since the agency bears the primary responsibility for evaluating the environmental impact of its proposed actions, the Commission's refusal to reopen the Midland construction permit hearing to consider "a colorable alternative" suggested by intervenors, but not previously evaluated, was arbitrary and capricious (Pet. No. 76-528, App. 12-14).

The Commission's view is that NEPA does not require the reopening of an agency proceeding to assess new information bearing on "alternatives," where the alternatives were neither obviously central to decision nor clearly identified as issues in the agency hearing at the outset. See 42 U.S.C. 4332(2)(C)(iii); *Interstate Commerce Commission* v. *Jersey City*, 322 U.S. 503, 514. The Commission contends that the court of appeals' opinion, by focusing on present perspectives on the energy conservation question, demonstrates a disregard for the rule of reason that has been applied in reviewing the sufficiency of the consideration of alternatives contained in environmental impact statements. See, *e.g.*, *Natural Resources Defense Council* v. *Callaway*, 524 F. 2d 79, 92 (C.A. 2); *Life of the Land* v. *Brinegar*, 485 F. 2d 460 (C.A. 9), certiorari denied, 416 U.S. 961. The court's use of judicial hindsight renders exceedingly difficult the achievement of finality in what is necessarily an extremely drawn-out and complex licensing process. See *Interstate Commerce Commission* v. *Jersey City*, *supra*, 322 U.S. at 514-515. Accordingly, the Commission submits that this question merits review by this Court if it agrees to review the first question presented.

The United States does not believe that this question merits review by this Court at this time. There is no significant conflict in the circuits concerning the standard

for review of the contents of an NEPA statement. The Court below recognized (Pet. No. 76-528, App. 12) that an agency need not consider remote and speculative alternatives, and that the applicable test for reviewing the sufficiency of the alternatives considered in the NEPA statement is the rule of reason. Thus, even if the court incorrectly applied that test in concluding that the Commission should have explicitly considered energy conservation as an alternative to the construction of the Midland facilities, that error is not likely to have a substantial precedential effect, and further review by this Court is unnecessary to provide guidance for the lower federal courts in reviewing other NEPA statements.

3. Petitioner in No. 76-528 also suggests that the court below erred in finding that the Commission's licensing board should have returned, *sua sponte*, the report on the Midland construction permits of the Commission's Advisory Committee on Reactor Safeguards (ACRS) for revision to improve the report's specificity (Pet. No. 76-528, pp. 20-23).[10] The federal respondents agree that the court was wrong. It should not have reversed agency action years after the event because of the licensing board's failure to perceive on its own initiative a duty, not then established, to return the ACRS report that arguably did not sufficiently inform the public. Whether or not some elaboration in the ACRS report would have been useful, neither agency law

[10]ACRS reports are not evidence in the licensing proceeding; rather they indicate that an expert committee has had the required opportunity to examine the proposed facility and advise the Commission of its safety concerns. The Midland report stated that the ACRS had concluded that "[o]ther problems related to large water reactors * * * identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports" would be resolved during construction. The court held that the licensing board should have asked the ACRS for a further explanation of these additional matters of concern and for cross-references to previous reports (Pet. No. 76-528, App. 17-21).

nor any other principle then operative suggested the existence of a duty to seek this enlargement on request, much less *sua sponte*.

The Commission accordingly suggests that this question, too, merits review by this Court if it decides to review the first question presented. The United States does not believe that the issue is of sufficient significance to merit review by this Court, either alone or in connection with a decision to review other issues in these cases.

CONCLUSION

In the view of the Nuclear Regulatory Commission, the petitions should be granted. The United States believes that the petitions should be denied.

Respectfully submitted.

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IN THE

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ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF FOR PETITIONER VERMONT YANKEE NUCLEAR POWER CORPORATION

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In The

Supreme Court of the United States

October Term, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.,

Respondents

No. 76-528

CONSUMERS POWER COMPANY,

Petitioner

v.

NELSON AESCHLIMAN, et al.,

Respondents

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF FOR PETITIONER VERMONT YANKEE NUCLEAR POWER CORPORATION

OPINIONS BELOW

A. Opinions of the Court of Appeals

These consolidated cases involve review of two decisions of the United States Court of Appeals for the District of Columbia Circuit. In *Vermont Yankee Nuclear Power Corp.* v. *Natural Resources Defense Council, Inc.*, No. 76-419, the opinion below was styled *Natural Resources Defense Coun-*

cil, Inc. v. *United States Nuclear Regulatory Commission.* The opinion, together with separate statements by Chief Judge Bazelon and Judge Tamm, was issued on July 21, 1976, *App.* 28-86, and corrected by an order of the Court of Appeals issued on October 8, 1976, *App.* 87-88. The opinion as corrected is reported at 547 F.2d 633. The uncorrected version of the opinion is unofficially reported at 9 ERC 1149.

In *Consumers Power Company* v. *Aeschliman,* No. 76-528, the opinion below was styled *Aeschliman* v. *United States Nuclear Regulatory Commission.* This opinion also was issued on July 21, 1976. *App.* 89-111. It is officially reported at 547 F.2d 622; it is unofficially reported at 9 ERC 1289.

B. Decisions and Orders of the United States Atomic Energy Commission

The decisions, orders, and promulgations of the then United States Atomic Energy Commission (AEC) (now the United States Nuclear Regulatory Commission (NRC))[1] which were on review in the Court of Appeals are all officially reported as follows:

1. Decisions in *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), AEC Dkt. No. 50-271:

   ALAB-56, 4 AEC 930 (1972). *App.* 112-29.

   ALAB-179, 7 AEC 159 (1974). *App.* 130-72.

2. Decisions in *Consumers Power Company* (Midland Plant, Units 1 & 2), AEC Dkt. Nos. 50-329, 50-330:

   ALAB-60, 5 AEC 261 (1972). *App.* 173-83.

[1] The AEC was abolished by the Energy Reorganization Act of 1974, 42 U.S.C. §§ 5801 *et seq.*, and its licensing and regulatory functions were transferred to NRC, 42 U.S.C. § 5841 *et seq.* The word "Commission" is used in this brief to refer to both AEC and NRC.

LBP-72-34, 5 AEC 214 (1972). *App.* 184-222.

ALAB-101, 6 AEC 60 (1973). *App.* 223-40.

ALAB-106, 6 AEC 182 (1973). *App.* 241-53.

ALAB-123, 6 AEC 331 (1973). *App.* 254-321.

ALAB-160, 6 AEC 1002 (1973). *App.* 322-23.

CLI-74-5, 7 AEC 19 (1974). *App.* 324-45.

CLI-74-7, 7 AEC 147 (1974). *App.* 346-47.

CLI-74-8, 7 AEC 149 (1974). *App.* 348-49.

CLI-74-15, 7 AEC 311 (1974). *App.* 350-51.[2]

3. AEC Rulemaking Orders:

   Atomic Energy Commission, Environmental Effects of the Uranium Fuel Cycle, Notice of Proposed Rule Making, 37 Fed. Reg. 24191 (Nov. 15, 1972). *App.* 352-60.

   Atomic Energy Commission, Dkt. No. RM-50-3, Environmental Effects of the Uranium Fuel Cycle, Notice of Hearing, 38 Fed. Reg. 49 (Jan. 3, 1973). *App.* 361-63.

   Atomic Energy Commission, Environmental Effects of the Uranium Fuel Cycle, 39 Fed. Reg. 14188 (April 22, 1974). *App.* 385-400.

[2] "LBP" denotes a decision by an Atomic Safety and Licensing Board which is the "trial court" in the Commission's administrative process. Licensing Board decisions are appealable as of right to (and in any event are reviewed, in the absence of appeal, *sua sponte* by) the Atomic Safety and Licensing Appeal Board. 10 C.F.R. §§ 2.762, 2.785. "ALAB" denotes a decision by the Appeal Board. Appeal Board decisions become final action of the Commission upon the passage of 20 days unless the Commission decides on its own motion to review the Appeal Board decision. 10 C.F.R. § 2.786. "CLI" denotes a decision of the Commission.

JURISDICTION

The judgments of the Court of Appeals were entered on July 21, 1976. The petition for certiorari in *Vermont Yankee,* No. 76-419, was filed on September 21, 1976. The petition for certiorari in *Consumers Power,* No. 76-528, was filed on October 14, 1976. The petitions were granted and the cases consolidated by order of this Court on February 22, 1977. This Court's jurisdiction is invoked under 28 U.S.C. § 1254 and 28 U.S.C. § 2350.

STATUTES AND REGULATIONS INVOLVED

The case involves the statutes and regulations listed below, the relevant portions of which are set forth in the Appendix to this Brief (*Br. App.*).

1. The Administrative Procedure Act, Section 4, 5 U.S.C. § 553. *Br. App.* A-1 - A-2.
2. The Atomic Energy Act of 1954, as amended, 42 U.S.C. §§ 2011 *et seq. Br. App.* A-3 - A-24.
3. The Energy Reorganization Act of 1974, as amended, 42 U.S.C. §§ 5801 *et seq. Br. App.* A-25 - A-71.
4. The National Environmental Policy Act of 1969, Section 102, 42 U.S.C. § 4332(2). *Br. App.* A-72 - A-74.
5. 10 C.F.R. § 51.20(e). *Br. App.* A-75 - A-76.

QUESTIONS PRESENTED FOR REVIEW

This brief is filed on behalf of the petitioner in *Vermont Yankee,* No. 76-419, and addresses only the issues raised in that petition.

1. Did the Court of Appeals err in holding that the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. § 4321 *et seq.,* imposes procedural requirements upon agency

rulemaking beyond those required by Section 4 of the Administrative Procedure Act, 5 U.S.C. § 553?

2. Did the Court of Appeals err in holding that NEPA makes licensing of nuclear power reactors in the United States contingent upon "thorough ventilation" of the environmental effects of nuclear fuel reprocessing and waste disposal by the Nuclear Regulatory Commission?

3. Did the Court of Appeals improperly substitute its judgment for that of the Nuclear Regulatory Commission on issues committed to that agency's discretion?

4. Did the Court of Appeals err in its review of the Nuclear Regulatory Commission's rulemaking proceeding in basing certain findings upon materials not in the agency record and published after the rulemaking proceeding had terminated?

STATEMENT OF THE CASE

A. The Uranium Nuclear Fuel Cycle

The term "fuel cycle" refers to the entire course of events which is involved in manufacturing, using, and disposing of the residue from, the fuel for a nuclear reactor. The fuel cycle includes a "front end" and a "back end." The "front end" comprises all events which precede the loading of the fuel into the reactor. The "back end" consists of the events after the spent fuel is shipped from the reactor site.

1. The "Front End" of the Nuclear Fuel Cycle

The "front end" of the uranium nuclear fuel cycle begins with the mining of uranium ore. *App.* 540. Most uranium reserves in the United States are located in the States of New Mexico, Wyoming, Texas, Colorado, and Utah. *App.* 576. After the ore is mined it is shipped to a milling facility, which

is licensed by the Commission,[3] where the raw ore is milled and refined to produce a uranium concentrate (U_3O_8), generally referred to as "yellowcake." *App.* 540, 578, 632. The yellowcake is then shipped to another facility, separately licensed by the Commission, which converts the yellowcake into uranium hexafluoride gas (UF_6) for use in a subsequent "enrichment process." *App.* 540, 634. The UF_6 gas is in turn shipped to a government owned, *App.* 964, enrichment facility where, by a gaseous diffusion process, the percentage of the fissile uranium isotope U^{235} is increased beyond that found in natural deposits of uranium.[4] *App.* 540, 576, 636. The UF_6 gas, the uranium in which is now enriched, is then shipped to a fuel fabricator — yet another separately licensed facility — where the gas is converted to a solid uranium compound, uranium dioxide (UO_2). *App.* 540, 578-79. If the fuel is intended for use in a nuclear reactor such as that which powers the electric generating station owned by petitioner, Vermont Yankee Nuclear Power Corporation (Vermont Yankee), the UO_2 is next shaped into pellets. The pellets are encapsulated in rods; the rods are then fabricated into "assemblies," *i.e.*, groups of rods (with the rods in each group standing on end and held in a square configuration, neighboring rods being equidistant one from another) for use in the reactor. *App.* 534. These events — from

[3] All facilities which are utilized in the fuel cycle after the mining of the raw ore are either government licensed or government controlled or licensed by states under programs approved by the federal government. *App.* 758, 802-803, 914.

[4] In nature over 99.2% of the element uranium (Atomic No. 92) is the isotope having an Atomic Weight of 238 (U^{238}), *i.e.*, 92 protons and 146 neutrons. Approximately 0.7% of the element is the isotope having an Atomic Weight of 235 (U^{235}), *i.e.*, 92 protons and 143 neutrons. U^{238} is not "fissile" or readily fissionable; U^{235} is. Thus, it is necessary to "enrich" the natural uranium by increasing the percentage of the U^{235} to between two and five percent. *See App.* 900-901.

the mine to the fabrication of fuel assemblies — constitute the "front end" of the fuel cycle, *i.e.*, the processes and activities which precede use in the reactor.

2. The Operation of a Nuclear Reactor and Creation of Radioactive Waste

The vast majority of the commercial nuclear electric power plants in the United States are powered, like Vermont Yankee's, by so-called light-water reactors (reactors).[5] *App.* 540. As indicated above, the basic fuel for most present generation reactors is U^{235} which is contained in pellets of uranium dioxide.[6] The result of the fission (splitting) of the nucleus of a U^{235} atom is the creation of fission products, free neutrons, and energy in the form of heat. The heat so created is used to make steam which in turn drives a turbogenerator, producing electricity.

Fission products are the two (or possibly more) "pieces" of the split atom. They are themselves other elements which may or may not be radioactive, depending upon which isotopes of which elements they are. Some fission products are highly radioactive and remain so for long periods of time.[7]

[5] The term "light-water" refers to the fact that normal water (H_2O) is used as the "moderator" (*i.e.*, device for slowing down neutrons) and also as the heat transfer medium for cooling the reactor.

[6] A reactor need not necessarily be fueled by U^{235}. Pu^{239} or isotopes of Thorium or any other fissile isotope theoretically can be used. *See* p. 9 *infra.*

[7] The length of time a given radioactive element remains radioactive depends upon its rate of decay and what it decays to. All radioactive elements decay over time. The rate of decay is measured in "half-lives"; a half-life being the time necessary for half of the atoms in a radioactive substance to decay to another nuclear form. The "daughter" element (*i.e.*, form decayed to) may or may not be itself radioactive. If it is, a new decay process is started and

The number of "free" neutrons produced as a result of a given fission cannot be predicted because it depends in the first instance upon the stability of the fission products produced[8]. At a constant power level only one neutron per fission is necessary to split another U^{235} nucleus and sustain the nuclear chain reaction. The remaining free neutrons either remain free or are absorbed into the nucleii of other elements present. Some of these neutrons are absorbed by the more abundant nonfissile U^{238} nucleii which results in the creation of an isotope of Plutonium (PU^{239}).[9] Pu^{239} has an extremely long half-life (*see* note 7 *supra*) of 25,000 years. *App.* 894. Being an "alpha emitter," it is not a particularly dangerous element from a radioactive emissions point of view[10] unless ingested into the human body. *App.* 1169-

a new "half-life" is involved. Half-lives have been measured by scientists and vary (depending upon the isotope involved) from millionths of seconds to billions of years.

[8] The average number per fission of U^{235} is 2.43. GLASSTONE, SOURCEBOOK ON ATOMIC ENERGY, §§13.41, 13.42 (3d ed. 1967).

[9] The capture of a free neutron by a U^{238} nucleus results in the creation of a new uranium isotope U^{239} which is radioactive. U^{239} decays through the emission of "beta" particles (electrons which are negatively charged). This is accompanied by the conversion of a neutron to a proton. The effect of the beta emission is thus to move up the atomic number of the nucleus by 1. Thus, U^{239} "decays" to an isotope of Neptunium (Atomic Number 93). The isotope is Np^{239}. Np^{239} is also a "beta" emitter and decays to the isotope of Plutonium (Atomic Number 94) known as Pu^{239}. GLASSTONE, *supra* note 8 at §§ 8.50-8.56, 11.49. The decay of U^{239} and Np^{239} is rapid, their half-lives being 23.5 minutes and 2.35 days, respectively. *Id.* § 16.26. Some of the Pu^{239} also fissions in the reactor after it is created and contributes to the energy production of the fuel wherein it is created.

[10] An alpha particle is the equivalent of a helium nucleus (*i.e.*, two protons and two neutrons). Alpha radiation has little penetrating power. It will not penetrate a rubber glove. GLASSTONE, *supra* note 8, § 18.60.

71. Pu^{239} is, like U^{235}, fissile and can be utilized as a reactor fuel. It is one of the isotopes which would be recovered in reprocessing and reused. Indeed, Pu^{239} is the fuel "created" by the breeder reactor.[11] Thus, while the plutonium created is sometimes referred to as "waste," see *App.* 33-34, it is not a "waste" which the electric industry desires to dispose of or store permanently;[12] rather it is a valuable fuel resource which may be utilized to produce electricity in the future.[13]

As a result of the fission process, spent fuel elements, when removed from the reactor, contain, *inter alia*, fission products, some U^{235} which has not fissioned, Pu^{239}, and U^{238}. *App.* 422-23. After removal from the reactor, the spent fuel is placed in a "spent fuel pool" which is part of the reactor installation analyzed under NEPA and the Atomic Energy Act in the individual reactor licensing proceeding. *App.* 535.

3. The "Back End" of the Nuclear Fuel Cycle.

The events which take place after shipment of the fuel from the site are collectively known as the "back end" of the fuel cycle. When the matters at bar were before the Com-

[11] *See Power Reactor Development Co.* v. *International Union of Electrical, Radio and Machine Workers, AFL-CIO*, 367 U.S. 396 (1961).

[12] *Hearings on Assessing the Policies, Plans, and Programs of the Executive Branch and the Nuclear Regulatory Commission for the Safe Storage and Disposal of Radioactive Wastes Produced in the Commercial Nuclear Fuel Cycle Before the Subcomm. on Environment and Safety of the Joint Comm. on Atomic Energy*, 94th Cong. 2d Sess. at 26 (1976).

[13] The Commission now has pending proceedings with respect to the question of whether reactors should be licensed to utilize Pu^{239} as fuel. As of this writing, it is unclear what ultimate effect the President's recently announced policy to discourage the recovery of Pu^{239}, *see* p. 27, *infra*, will have on these proceedings.

mission, the expectation was that the spent fuel, after a period of three to four months in the spent fuel pool, would be shipped to a separately licensed fuel reprocessing facility. *App.* 416. The reprocessor would then, by various processes, separate and recover elements contained in the spent fuel which could be reused in the fuel manufacturing process.[14] *App.* 585-86. Left over from the reprocessing would be "high-level waste," consisting for the most part of fission products. This high-level waste was then to be shipped to Commission waste management sites for long-term management or "disposal." *App.* 610.

At this time, however, no reprocessing facilities are operating in the United States. High-level wastes from past reprocessing operations are now stored in temporary facilities. The spent fuel removed from reactors since the cessation of reprocessing is, for the most part, being stored in spent fuel pools at the various power reactor sites.

The total amount of high-level radioactive waste stored in temporary facilities in the United States as of May, 1976, was 76,600,000 gallons.[15] The vast majority of this waste, 99% (or 76,000,000 gallons), was created not by electric power generation but as a result of the United States Government's weapons program.[16] Indeed, it is currently projected that as of the year 2000 the waste created as a result of power plant operation will constitute only approximately ten per cent of the total high-level waste requiring management.[17] *See* also *App.* 1065, 1079.

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[14] U^{235}, Pu^{239} and U^{238}.

[15] *Hearings on Assessing the Policies, Plans, and Programs of the Executive Branch and the Nuclear Regulatory Commission for the Safe Storage and Disposal of Radioactive Wastes Produced in the Commercial Nuclear Fuel Cycle, supra* n. 12 at 123-24.

[16] *Id.*

[17] *Id.*

While the technology exists to permit the safe storage of the high-level wastes, *App.* 830-32, the Commission has yet to select the optimum "long-term" solution to the management of high-level waste from among the available alternatives, *see* note 56 *infra.* Several solutions have been proposed including construction of an above-ground engineered facility, burial in salt deposits, and short-term (100 years) use of a retrievable waste storage facility while final long-term technologies are developed. *See* pp. 20, 52-57 *infra.*

B. Description of the Petitioner

Vermont Yankee, petitioner in No. 76-419, is a Vermont corporation. Vermont Yankee is the owner of Vermont Yankee Nuclear Power Station (the Station). The Station is a nuclear electric generating station, *App.* 405, located in the Town of Vernon, Vermont, on the west bank of the Connecticut River. *App.* 401. The Station is the largest single electric generating source of energy in the State of Vermont. It is one of seven nuclear generating units now operating in New England, which units produced over 30% of the electric energy used last year in the region.

C. Proceedings Prior to the Court of Appeals' Action

1. The Commission Licensing Process — In General

The licensing process which a nuclear power plant goes through is tortuous and lengthy. It begins with the filing of an application for a construction permit. Typical applications now consist of twenty or more three-inch thick volumes of data covering myriad safety and environmental matters. *See* 10 C.F.R. § 50.34; 10 C.F.R. Part 51. After a preliminary review of the application by the Commission's staff, 10 C.F.R. § 2.101(a)(1), the application is then docketed if the preliminary review reveals *prima facie* compliance with Commission Regulations governing the form of applications. 10 C.F.R. § 2.101(a)(2). Then commences a detailed review by the Commission staff which typically takes

eighteen to twenty-four months. In addition, the safety aspects of the design are reviewed and commented upon by the Advisory Committee on Reactor Safeguards, a statutorily created group of outstanding technical experts in the various disciplines involved in nuclear technology. 42 U.S.C. §§ 2039, 2232(b).

The Atomic Energy Act of 1954 requires that a public hearing be held before a construction permit can issue. 42 U.S.C. § 2239. Under Commission Regulations, 10 C.F.R. Part 2, these hearings are conducted by an Atomic Safety and Licensing Board (Licensing Board) composed of three members, typically a lawyer chairman and two technically trained members. 42 U.S.C. § 2241; 10 C.F.R. § 2.721. The Licensing Board hearings are, in the fullest sense, adversary or trial-type proceedings with full rights of cross-examination, discovery, and all the other appurtenances of a courtroom proceeding. After such a hearing the Licensing Board issues an "Initial Decision" which, if favorable to the applicant, authorizes the issuance of a construction permit.[18] 10 C.F.R. § 2.760. For many years the Commission's Regulations have provided that a Licensing Board's initial decision will be immediately effective and the authorized permit will issue unless the Licensing Board or the Commission's Atomic Safety and Licensing Appeal Board (Appeal Board) finds good cause for ordering otherwise. 10 C.F.R. § 2.764(a).

Exceptions to the Licensing Board decision may be taken to an Appeal Board by any party. 10 C.F.R. §§ 2.762, 2.785(a). And, whether or not exceptions are taken, the Appeal Board, in any event, conducts a *sua sponte* review of

[18] The Licensing Board does not itself issue permits or licenses; these are issued by the Director of Regulation upon Licensing Board authorization. 10 C.F.R. § 2.764.

the decision.[19] The Appeal Board has all of the powers of review of the Commission including the right to substitute its judgment for that of the Licensing Board.[20] Finally, further review of the decision may be had by the Commission on its own motion. 10 C.F.R. § 2.786. If no review is taken, however, the Appeal Board's decision constitutes final agency action after 20 days have elapsed. *Id.* Assuming some party still deems itself aggrieved, review is available in the Courts of Appeals, 28 U.S.C. §§ 2341 *et seq.*, and finally in this Court by way of a petition for a writ of certiorari, 28 U.S.C. § 2350.

Once the plant is constructed the utility must then apply for an operating license. 42 U.S.C. § 2235. Again, the staff carries out extensive review of the operating license application, concentrating in particular on changes in design which have occurred during the construction process. A public hearing is not mandated by statute on an operating license application, but the Commission must grant a hearing if any party with an interest requests one.[21] The result is a second set of proceedings through the Licensing Board "trial", the Appeal Board, the Commission and the courts.

[19] *E.g., The Detroit Edison Company* (Enrico Fermi Atomic Power Plant, Unit 2), ALAB-77, 5 AEC 315 (1972).

[20] *E.g., Duke Power Company* (Catawba Nuclear Station, Units 1 & 2), ALAB-355, NRCI-76/10 397, 403 (Oct. 29, 1976).

[21] 42 U.S.C. § 2239. As a matter of practice, the Commission grants hearings virtually upon request. The Commission has held, for example, that anyone who lives within 40 miles of a reactor has "standing" to request a hearing. *E.g., Northern States Power Company* (Prairie Island Nuclear Generating Plant, Units 1 & 2), ALAB-107, 6 AEC 188, 190, *reconsid. denied*, ALAB-110, 6 AEC 247, *affirmed*, CLI-73-12, 6 AEC 241 (1973). All such a person need do in addition is allege one contention cognizable under the Atomic Energy Act or NEPA to require a hearing. *E.g., Mississippi Power and Light Company* (Grand Gulf Nuclear Station, Units 1 & 2), ALAB-130, 6 AEC 423, 424 (1973).

While in past years this entire process was somewhat shorter, *see* pp. 14-17 *infra*, today it has reached a state where the accepted wisdom is that 10 years from the construction permit application date must be allowed to bring a nuclear power plant into commercial operation although the actual construction requires only five to six years.

2. The Licensing Proceedings for Vermont Yankee

Vermont Yankee first made application to the Commission for a construction permit for the Station over ten years ago on December 2, 1966. After an adjudicatory hearing before a Licensing Board the construction permit was granted on December 11, 1967. *App.* 112 n. 1.

On December 31, 1969, Vermont Yankee made application for the operating license for the Station. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), Initial Decision, 4 AEC 776 n. 1 (1972). Adjudicatory hearings were requested by several "intervenors" including respondents Natural Resources Defense Council and New England Coalition on Nuclear Pollution.[22] The Commission granted a hearing and after various pretrial proceedings, the hearing was commenced on August 10, 1971, before a Licensing Board.

[22] The third respondent in No. 76-419, Consolidated National Intervenors, Inc., is an umbrella organization which includes in its membership the respondents Natural Resources Defense Council, Inc., and New England Coalition on Nuclear Pollution. Consolidated National Intervenors, Inc., participated in the Commission's rulemaking proceeding described at pp. 18-23 *infra*, and spoke for itself and the other two respondents in that proceeding. As noted by the Court of Appeals, *App.* 30-31 n. 2; 547 F.2d at 637 n. 2, these three organizations (petitioners in that court) adopted essentially the same position on almost all issues. In light of this and the fact that distinctions among these organizations are not material to any issue in this case, they, and each of them, are referred to herein as "intervenors."

During the pretrial phase of the *Vermont Yankee* operating license hearing, the intervenors sought information about fuel reprocessors and high-level waste disposal operations. *App.* 417-18, 481-83. Vermont Yankee objected on the grounds that such activities, which would be the subject of intense scrutiny in separate licensing proceedings for reprocessing or disposal facilities, were not a relevant subject of inquiry in a power plant licensing proceeding. The Licensing Board sustained Vermont Yankee's objection, *App.* 410, and adhered to this position despite a motion for reconsideration. *App.* 485-87.

On August 10, 1971, after the decision of the United States Court of Appeals for the District of Columbia Circuit in *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC*, 449 F.2d 1109 (D.C. Cir. 1971), the intervenors renewed their efforts to raise waste reprocessing and disposal questions in the *Vermont Yankee* licensing proceeding. Once again, on October 21, 1971, the Licensing Board adhered to its prior ruling. *App.* 517. In this instance, however, the Licensing Board authorized an interlocutory appeal of its ruling.[23] *Id.*

On June 6, 1972, the Appeal Board ruled on the intervenors' interlocutory appeal. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), ALAB-56, 4 AEC 930 (1972). *App.* 112-29. The Appeal Board[24] sustained the Licensing Board. It reasoned

[23] While this interlocutory appeal was pending, Vermont Yankee sought and, on March 14, 1972, obtained a testing license to operate the Station at no more than 1% power. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), Initial Decision, 4 AEC 776 (1972). Thereafter, the Station operated in accordance with the license limits, creating the first nuclear waste in the reactor. The intervenors did not appeal this Licensing Board decision administratively or to the courts.

[24] Like the Licensing Board, the *Vermont Yankee* Appeal Board consisted of a lawyer chairman and two nuclear engineers.

that, since the only "proposed action" before the agency was the licensing of the Station to operate, NEPA did not require exploration of the environmental effects of reprocessing or disposal facilities which would be the subject of separate licensing proceedings. *App.* 116-22. Further, the Appeal Board observed that given the nature of the nuclear fuel cycle and the industry itself, any exploration of the environmental effects of the back end of the fuel cycle in the context of a single reactor's operating license proceeding would be neither meaningful nor possible. *App.* 120. In addition, the Appeal Board held that sustaining the intervenors' position on the breadth of reactor licensing proceedings ". . . could as a practical matter call a halt to the licensing of individual reactors." *App.* 123.

After this interlocutory ruling of its Appeal Board, the Commission consistently followed the doctrine thus established. The issues of reprocessing and waste disposal were excluded from other licensing cases and, in addition, similar issues arising out of the "front end" of the fuel cycle (mining, milling, and fabrication) were also excluded. *See, e.g., Consumers Power Company* (Midland Plant, Units 1 & 2), ALAB-60, 5 AEC 261 (1972);[25] *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), ALAB-72, 5 AEC 297 (1972); *Long Island Lighting Company* (Shoreham Nuclear Power Station), ALAB-99, 6 AEC 53 (1973); *Long Island Lighting Company* (Shoreham Nuclear Power Station), ALAB-156, 6 AEC 831 (1973).[26]

[25] The Court of Appeals' decision striking down the Commission action in the *Midland* case is the subject of the case consolidated with this one, *Consumers Power*, No. 76-528.

[26] The action of the Court of Appeals in remanding the Commission order in the *Shoreham* proceeding is the subject of a petition for certiorari now pending in this Court. *Long Island Lighting Co.* v. *The Lloyd Harbor Study Group, Inc.*, No. 76-745. The Court of Appeals in that case decided the matter by a *per curiam* order which relied, without further discussion, on the decisions under review in Nos. 76-419 and 76-528.

On October 12, 1972, the Commission issued to Vermont Yankee a full power temporary operating license for the Station.[27] *App.* 131 n. 1. The intervenors did not seek judicial review of this Commission action in the courts. At the same time, the hearings on the Station's full term operating license continued apace.

On February 27, 1973, the Licensing Board in the Vermont Yankee licensing proceeding issued its decision authorizing issuance of the full power, full term operating license. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), LBP-73-8, 6 AEC 130 (1973). Exceptions from this decision were taken to the Appeal Board by the intervenors and on February 28, 1974, the Appeal Board issued a decision affirming the Licensing Board decision as modified in respects not here material. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), ALAB-179, 7 AEC 159 (1974). *App.* 130-72. In this decision, as in other licensing cases, the Appeal Board adhered to its prior rulings in the *Vermont Yankee* interlocutory appeal (ALAB-56) that the issues of reprocessing and waste disposal should be excluded from reactor licensing proceedings. *App.* 137. On March 27, 1974, pursuant to 28 U.S.C. §§ 2342, 2343, the intervenors petitioned the United States Court of Appeals for the District of Columbia Circuit for review of the Appeal Board decision. *App.* 1.

[27] The temporary operating license was granted to Vermont Yankee under § 192 of the Atomic Energy Act, 42 U.S.C. § 2242. The Station was the only nuclear power plant ever granted a temporary operating license under § 192; the authority granted by that statute has now expired under its own terms.

3. The Rulemaking Proceedings on the Fuel Cycle

On November 15, 1972, about one month after the issuance of the Station's temporary operating license, described above, the Commission published in the Federal Register[28] a Notice of Proposed Rulemaking. *App.* 352-60 This notice announced a rulemaking proceeding to consider how, if at all, the environmental effects of the back and front ends of the fuel cycle should be factored into the "cost-benefit" analysis required in individual reactor licensing proceedings by *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC,* 449 F.2d 1109 (D.C. Cir. 1971). *App.* 352.

A legislative-type hearing was noticed for February 1, 1973, *App.* 358, and all "interested persons" were invited to participate by way of written or oral statements. *App.* 359. In addition, an opportunity was provided to submit written statements separate and apart from any statement made at the hearing.[29] The notice also announced that the technical staff of the Commission had prepared a report entitled *Environmental Survey of the Nuclear Fuel Cycle* (Nov., 1972), *App.* 355, which described the annual fuel cycle effects attributable to the operation of a model 1000 MW(e) nuclear power unit, together with the methodology and assumptions used by the staff in arriving at its conclusions. *App.* 538-646. The staff conclusions were summarized in a table entitled "Table S-3". *App.* 358. The Fuel Cycle Survey was made available prior to the hearing to all interested

[28] 37 Fed. Reg. 24191.

[29] On January 3, 1973, the Commission published a "Notice of Hearing" for the rulemaking and appointed a Hearing Board consisting of a lawyer chairman and two technical members to conduct the hearing. 38 Fed. Reg. 49; *App.* 361-63. As was the case with the original Notice of Proposed Rulemaking, *App.* 359, the Notice of Hearing emphasized that the hearing would be of the legislative type, and, therefore, no discovery or cross-examination would be permitted. *App.* 361.

persons, *App.* 361-62, and the Commission also made available the background studies, handwritten staff calculations, and superseded drafts of the survey. *App.* 389-90. In addition, the only prehearing request for further documents made by any party was honored by the Commission's staff. *App.* 390 n. 2; *see also App.* 683.

The rulemaking hearings were held on February 1-2, 1973. *See App.* 655-1023. All participants, including the intervenors, were afforded such time as they desired to present their comments and information. *App.* 367, 389. At the hearing, in an opening statement, the intervenors' counsel suggested a need for rights of cross-examination and discovery in order properly to resolve the substantive issues involved.[30] *App.* 837, 844. At no time during the hearing, however, did the intervenors attempt to make any showing as to what matters cross-examination would bring out that were otherwise incapable of presentation. *App.* 389.

[30] In its opinion the Court of Appeals characterizes this statement as a demand for adjudicatory trial-type proceedings in the rulemaking hearing. 547 F.2d at 643-44 n. 25; *App.* 44-45 n. 25. Actually counsel was not making such a demand in the context suggested by the Court of Appeals. *App.* 844. Rather counsel was suggesting that the intervenors' "Alternate 3" to the proposed rule be adopted. This in substance was an alternative calling for a future and open-ended generic hearing, adjudicatory in nature. *App.* 1043-44. No demand for trial-type procedures in the proceeding then in progress was made by the intervenors at the prehearing conference. *App.* 655-99. Indeed, during the oral hearing, the same counsel quoted by the Court of Appeals in its opinion stated flatly that his client (the intervenors) ". . . made no objection to the conduct of this hearing in exactly the form it is in." *App.* 933. The Court of Appeals does suggest: "The public-interest intervenors submitted a thorough legal brief demanding cross-examination and discovery rights. CNI-UCS Statement with Respect to Legal Consideration of the Proposed Regulations on the Nuclear Fuel Cycle, 20-29; II-J.A. 225, 245, 254." *App.* 44 n. 25. However, the "thorough legal brief" was filed March 2, 1973, one month after the oral hearings terminated. *App.* 1057.

During the staff presentation at the rulemaking hearing, Dr. Frank K. Pittman, Director of the Commission's Division of Waste Management and Transportation, read into the record a statement on waste disposal. *App.* 776-800. In this statement, Dr. Pittman described the projected design parameters for a 100-year-life retrievable surface storage facility for nuclear wastes — to be used while ongoing studies are continued to determine the optimum method for permanent storage of such wastes. The retrievable surface storage concept included the "canning" of waste in canisters and storing the canisters in a special structure which would incorporate necessary safety and security systems. *App.* 780-82, 1306-1309.

The opinion of the Commission's staff expressed at the hearing was that the future impacts upon the human environment resulting from the fuel cycle of a single reactor, including waste disposal, would be small. *App.* 773. A number of other participants addressed the subject of waste disposal. These included a witness for the intervenors. *App.* 879-98. No witness challenged the details of Dr. Pittman's technical presentation. See *App.* 951. The concerns expressed were rather in the nature of worries that no long-term solution to the nuclear waste problem had been, or would be, found. *App.* 865-66, 894-98, 905-907.

The Hearing Board questioned the speakers at the hearing. *E.g. App.* 802-27, 830-35, 898-950, 992-1005, 1016-23. In particular, the Hearing Board put questions on the subject of waste disposal to Dr. Pittman, *App.* 830-35, and to the technical witness presented by the intervenors, *App.* 898-911. The Hearing Board's questioning dealt specifically with Dr. Pittman's basic conclusion that a storage facility could be built and operated using presently available technology. *App.* 830-32. Dr. Pittman made clear that neither construction of the facility nor its subsequent operation was contingent upon the development of any new technology. *App.* 830-32. Upon the close of the hearing, in accordance with the notice thereof, *App.* 363, the record was left open for a period of thirty days to allow further comments. *App.* 367. The intervenors took full advantage of this opportunity, *App.* 1035-57, 1067-1107, and, indeed, at the request of the intervenors and others the record was held open for further comments even beyond the thirty day period. *App.* 368. Moreover, opportunity was provided for comments on the further comments. *App.* 368. Thereafter, the Hearing Board, as required by the notice calling the hearing, issued a report to the Commission and certified the record to the Commission for final decision. *App.* 364-84.

On April 16, 1974, the Commission published its decision, a new Uranium Fuel Cycle Regulation, 39 Fed. Reg. 14188 (Apr. 22, 1974), *App.* 385-400, which was subsequently codified, with minor amendments, as 10 C.F.R. § 51.20(e). At the same time the Commission's staff also issued a new version of the Fuel Cycle Survey entitled *Environmental Survey of the Uranium Fuel Cycle,* WASH-1248, April 1974, *App.* 392-93 (hereinafter referred to as the "Environmental Survey"), which incorporated certain changes in the original survey found appropriate in light of the matters adduced at the rulemaking proceeding. In particular it incorporated the material on waste storage placed in the record through the testimony and other submissions of Dr. Pittman.

The regulation as promulgated required that future environmental impact statements prepared in connection with individual reactors include the Final Table S-3 summarizing the environmental effects of the fuel cycle, and that the effects so summarized and quantified be factored, as an environmental "cost," into the *Calvert Cliffs'* "cost-benefit analysis" with respect to each reactor. *App.* 385-86. The

regulation also provided that no further discussion of the environmental effects of the fuel cycle was required in reactor licensing proceedings, thus obviating the need for extended consideration of the environmental effects of the fuel cycle in each future reactor licensing case. *App.* 398.

The regulation was accompanied by a statement of basis and purpose. *App.* 385-98. The statement described the background of the rulemaking, *App.* 385-86, recited the events surrounding the hearing, *App.* 387-89, and dealt with various issues identified to the Commission by the Hearing Board which the board believed to be worthy of particular attention. *App.* 389-98. The Commission discussed and rejected the procedural challenges to the rulemaking made by the intervenors. *App.* 389-90. It reviewed the adequacy of the original survey and concluded that the survey and the hearing record provided an adequate data base for the regulation adopted. *App.* 390-92. Turning to the question of high-level waste storage, the Commission concluded that with one minor adjustment, the proposed table (S-3) did accurately reflect the anticipated environmental effects from a storage facility such as that described by Dr. Pittman. *App.* 392. The Commission acknowledged that no such facility had yet been built, but pointed out that designs had been developed ". . . using existing technology based on well-established data and techniques." *App.* 392. The Commission expressed its view that sufficient data were presented to justify the conclusion that the environmental effects of waste storage and disposal were relatively insignificant, but the Commission promised that a revision of the Environmental Survey would be undertaken if subsequent experience so dictated. *App.* 394-95. Finally, the Commission ruled that, since the proceeding had demonstrated the environmental effects of the fuel cycle to be relatively insignificant, there existed no need to reopen

completed proceedings, such as *Vermont Yankee,* to factor in the costs disclosed in Table S-3. *App.* 395. On June 7, 1974, the intervenors petitioned for review of the rule in the Court of Appeals. *App.* 6.

D. The Action of the Court of Appeals

The United States Court of Appeals for the District of Columbia Circuit consolidated for argument the *Vermont Yankee* and the *Rulemaking* petitions. *App.* 3. Argument was had on the consolidated cases, and one year and almost two months later, on July 21, 1976, the Court of Appeals issued a decision. 547 F.2d 633; *App.* 28-71.

Relying on its prior decisions in *Scientists' Institute for Public Information, Inc. (SIPI)* v. *AEC,* 481 F.2d 1079 (D.C. Cir. 1973), and *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC,* 449 F.2d 1109 (D.C. Cir. 1971), the Court of Appeals held that Commission rulemaking must be accomplished by procedures which were sufficient to "ventilate" the issues and create a meaningful "dialogue." 547 F.2d at 643-44; *App.* 44-50. Full "ventilation" arising from meaningful "dialogue" was held to be necessary in rulemaking proceedings held in "the NEPA context." 547 F.2d at 645 n. 34; *App.* 48 n. 34. The Court of Appeals found that the procedures used in the rulemaking were not sufficient to meet this standard. In particular, the court held that the Commission's reliance on Dr. Pittman's testimony was misplaced; that the Commission, therefore, had failed to address "the major contentions that were raised"; and that the rule was invalid and the matter should be remanded for further proceedings to create "a genuine dialogue." 547 F.2d at 652-53; *App.* 65-71.

The Court of Appeals refused to specify what further procedures it wished the Commission to follow in order to

achieve the "genuine dialogue" which the court sought. Rather the court catalogued a number of procedural devices which, it said, were available to the Commission. 547 F.2d at 653; *App.* 67. Having done so, the court then observed that perhaps none of these devices might be sufficient: the Commission might be required to "develop new procedures to accomplish the innovative task of implementing NEPA through rulemaking." *Id.* On the other hand, the court said, perhaps the very procedures actually employed by the Commission would suffice, "if administered in a more sensitive, deliberate manner." 547 F.2d at 653-54; *App.* 67.

In light of its disposition of the rulemaking case, the Court of Appeals held that the Vermont Yankee licensing order must be remanded. The court rejected the Appeal Board's position that analysis of the environmental effects of waste disposal in an individual reactor licensing proceeding would not be meaningful or possible; in the Court of Appeals' view, meaningful information on such effects was available and NEPA required that a forecast as to them be made now. 547 F.2d at 639-40; *App.* 36-37. The Appeal Board's second rationale — that these matters would be gone over in detail in separate licensing proceedings involving waste disposal facilities — was also rejected. 547 F.2d at 640-41; *App.* 37-39. Relying on its own prior decisions, the court held that the Commission could not await the coming of a specific proposal for a waste disposal facility; instead, the court held, NEPA required present exploration of these issues and the making of what amounted to a full environmental analysis with respect to them. 547 F.2d at 640-41; *App.* 38-39. The court did acknowledge that the Commission had discretion to deal with waste disposal and reprocessing issues in generic rulemaking proceedings, as opposed to relitigating these issues on a case-by-case basis in individual licensing proceedings. 547 F.2d at 641

n. 17; *App.* 40 n. 17. However, the court held that, in the absence of a valid generic proceeding, the issues remained ripe for consideration in individual licensing cases. *Id.* Since these issues had not been resolved in the *Vermont Yankee* proceeding, the Vermont Yankee licensing order was remanded.

On October 8, 1976, the Court of Appeals issued an order correcting its opinion. *App.* 87-88. This correction was the result of a motion filed by the Commission. In that motion, the Commission pointed out that, contrary to the repeated assertions in Court of Appeals' original opinion that Dr. Pittman had not been questioned by the Hearing Board, *App.* 61 & n. 53, 62, 66, 68 n. 59, Dr. Pittman in fact had been so interrogated, *App.* 830-35. As a result, the Court of Appeals issued the October 8, 1976 order deleting three of the assertions. The Court of Appeals left its opinion otherwise unchanged. *App.* 87-88.

E. Subesquent Events

Since the original decision of the Court of Appeals both the Commission and the President have sought to deal with the continuation of nuclear licensing.

Initially the Commission issued, on August 13, 1976, a General Policy Statement setting forth the Commission's response to the court's original decision. 41 Fed. Reg. 34707.[31] The General Policy Statement required reopening of the *Vermont Yankee* operating license hearing, initially to consider whether the license should be revoked or suspended pending the resolution of the rulemaking; it directed

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[31] Reprinted in Appendix to the Petition for Certiorari in No. 76-419 at pages A-149—A-158.

the staff to prepare a new environmental survey; and it declared a moratorium upon the issuance of operating licenses or construction permits pending promulgation of an interim rule. *Id.* On October 13, 1976, the Commission promulgated a notice of proposed rulemaking, setting out its interim rule for use — while proceedings with respect to a final rule were going forward — in considering the environmental impacts of fuel reprocessing and waste management. 41 Fed. Reg. 45849 (Oct. 18, 1976).

On November 5, 1976, the Commission issued a new order with respect to Vermont Yankee's operating license; it suspended the proceedings against Vermont Yankee, based on its determination that the interim rule on environmental effects of the fuel cycle was not likely to be substantially different from the rule produced by the prior rulemaking. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), CLI-76-18, NRCI-76/11 470 (Nov. 5, 1976).[32] On the same day the Commission promulgated a Supplemental General Statement of Policy, 41 Fed. Reg. 49898 (Nov. 11, 1976).[33] The Supplemental Statement announced that the Commission would not initiate show-cause proceedings against holders of construction permits, limited work authorizations, or operating licenses for nuclear reactors; that the Commission would suspend show-cause proceedings already begun; and that licensing could resume in individual cases whenever it could be found that use of the numerical values of the proposed interim rule would not "tilt the cost-benefit balance against the issuance of the license." *Id.*

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[32] Reprinted in Supplemental Appendix to the Petition for Certiorari in No. 76-419 at pages SA-25—SA-28.

[33] Reprinted in Supplemental Appendix to the Petition for Certiorari in No. 76-419 at pages SA-20—SA-24.

On March 7, 1977, the Commission adopted a "final interim rule," setting out the interim rule which would be in effect pending adoption of a final rule to deal with the environmental effects of reprocessing and waste disposal. 42 Fed. Reg. 13803 (March 14, 1977), and on May 20, 1977, 42 Fed. Reg. 26987 (May 26, 1977), the Commission issued a notice of reopened hearing to consider a new "final" rule. The provisions of the "final interim rule," which is now in effect and governs current licensing proceedings, are not substantially different from those of the proposed rule, nor, indeed, from those of the rule as initially adopted. Moreover, because the differences were not sufficient to warrant revocation or suspension on cost-benefit grounds, pending show-cause proceedings initiated pursuant to the General Policy Statement were to be terminated. 42 Fed. Reg. at 13806. In the *Vermont Yankee* case the Commission directed its Appeal Board to make a specific determination as to whether there would be a tilt in the cost-benefit balance. *Vermont Yankee Nuclear Power Corporation,* CLI-77-10, 5 NRC —, 2 CCH NUCLEAR REG. RPTR. § 30,171 (April 1, 1977). On May 13, 1977 the intervenors petitioned the Court of Appeals for review of the "final interim rule." *Natural Resources Defense Council* v. *NRC* (D.C. Cir. No. 77-1448).

In addition to the Commission's activity (essentially reaffirming its prior position), the President has asked the Congress to address energy questions on a broad front. As a part of his approach to energy the President has emphasized the use of nuclear power and coal as replacements for oil. At the same time the President has taken steps to discourage the construction of breeder reactors (which would create Pu^{239}, *see* pp. 8-9 *supra*) and the reprocessing of fuel from existing nuclear reactors (which also results in the separation and concentration of Pu^{239}). 13 PRES. DOC. 560 *et seq.*, 566 *et seq.* (Apr. 25, 1977).

SUMMARY OF ARGUMENT

Five reasons are urged for reversal of the Court of Appeals' decision. First, the Court of Appeals erred in holding that the procedures used in the Commission's rulemaking proceeding were insufficient. Pp. 30-38 *infra*. The Commission is not an agency which is required by its organic statute to adopt regulations only after a hearing "on the record." P. 30 *infra*. This Court has held that rulemaking by such agencies need comply only with the procedures delineated in Section 4 of the Administrative Procedure Act. P. 30 *infra*. These procedures were fully complied with in the adoption of the regulation at issue. Pp. 31-34 *infra*. In particular, the statement of basis and purpose dealt with all issues raised in the agency record, and articulated the determinative reason for the final action taken with respect to each issue. Pp. 32-34 *infra*. NEPA cannot be construed as providing a basis for more or different procedures than those required by Section 4 of the Administrative Procedure Act. Pp. 35-38 *infra*.

Second, the Court of Appeals has arrogated to itself the right of the Commission to define the scope of the "proposed action" before it. Pp. 39-45 *infra*. The Court of Appeals has refused to accept the Commission's rulings as to the feasibility of writing a meaningful environmental impact statement on waste disposal facilities at this time, pp. 44-45 *infra*, and faulted the Commission for not preparing what amounts to a full environmental impact statement on a nuclear waste disposal facility despite the fact that no such facility was before the Commission for approval, pp. 42-44 *infra*. All of these holdings transgress the principles governing the timing and scope of NEPA environmental impact statements laid down by this Court in *Kleppe* v. *Sierra Club*, 427 U.S. 390 (1976). Pp. 43-45 *infra*.

Third, the Court of Appeals erred in construing NEPA to require a full "ventilation" and, indeed, resolution of the environmental effects of waste disposal prior to any further licensing of nuclear power plants in the United States. Pp. 46-51 *infra*. Such a holding flies in the face of a long history of Congressional legislation concerning, and Congressional oversight of, nuclear power, pp. 46-48 *infra*, and is clearly at odds with the intent expressed by Congress in passing legislation with respect to nuclear power several years after the passage of NEPA, pp. 48-51 *infra*.

Fourth, the decision of the Court of Appeals represents a massive substitution by that court of its judgment for that of the Commission in matters committed to the Commission's informed discretion. Pp. 51-65 *infra*. The Court of Appeals erred in substituting its judgment for that of the Commission as to the type and extent of interrogation required to assure the Commission of the correctness of certain technical testimony, pp. 60-65 *infra*, the credence to be given to the testimony of its technical staff, pp. 58-60 *infra*, and the degree of technical detail which the Commission needed to reach its decision, pp. 52-58 *infra*.

Fifth, the Court of Appeals erred in utilizing articles published after the rulemaking proceeding had ended and which were not part of the agency record, as a basis for creating an alleged conflict with certain testimony relied upon by the Commission. Pp. 65-66 *infra*.

For each and all of the foregoing reasons, reversal of the Court of Appeals' decision is urged.

ARGUMENT

I. THE COURT OF APPEALS ERRED IN HOLDING THAT NEPA REQUIRES THE USE OF PROCEDURES IN AGENCY RULEMAKING PROCEEDINGS BEYOND THOSE REQUIRED BY THE ADMINISTRATIVE PROCEDURE ACT

The Court of Appeals rejected the Commission's rule (and, as a consequence, remanded the Vermont Yankee licensing order) on the basis of one legal premise fundamental to its entire decision. That fundamental premise was that agency rulemaking "in the NEPA context" must employ additional procedures beyond those required by Section 4 of the Administrative Procedure Act, 5 U.S.C. § 553. The premise is simply wrong.[34]

The Commission's basic statute is the Atomic Energy Act of 1954, as amended, 42 U.S.C. § 2011 *et seq.*, which does not require a hearing "on the record" for rulemaking. 42 U.S.C. § 2239(a); *Siegel* v. *AEC*, 400 F.2d 778, 785-86 (D.C. Cir. 1968). Absent such a specific statutory requirement, it is settled law that only those procedures set forth in Section 4 of the Administrative Procedure Act, 5 U.S.C. § 553, need be followed. *United States* v. *Florida East Coast Railway Co.*, 410 U.S. 224, 237-38 (1973); *United States* v. *Allegheny-Ludlum Steel Corp.*, 406 U.S. 742, 756-58 (1972). *See also American Trucking Associates, Inc.* v. *United States*, 344 U.S. 298, 318-20 (1953). These procedures were complied

[34] The Court of Appeals' willingness to prescribe additional procedures for agencies "in the NEPA context" is also challenged — in connection with a licensing proceeding — in the case consolidated with this one, *Consumers Power*, No. 76-528. In that case the Court of Appeals effectively invalidated the Commission's rule that an intervenor had to meet a "threshold test" before the Commission could be required to explore in detail energy conservation alternatives. The propriety of imposing some such burden of going forward is also at issue in *Vermont Yankee*, No. 76-419, because of the intervenors' unexplained demands for cross-examination and discovery. *See* p. 36 n. 40, p. 64 *infra*.

with in full measure in the Commission's rulemaking and the Court of Appeals was without authority to require more, "NEPA context" or not.

A. The Commission's Rulemaking Procedures Complied with, and Exceeded, the Requirements of the Administrative Procedure Act

Section 4 of the Administrative Procedure Act, 5 U.S.C. § 553, is clear with respect to what is required in a rulemaking. The statute requires (1) a proper notice of the proposed rule be published in the Federal Register; (2) that "interested persons" be given:

> ". . . an opportunity to participate in the rule making through submission of written data, views or arguments with or without opportunity for oral presentation;"

and (3) that, after consideration of the relevant matter presented, the agency incorporate in the rules adopted "a concise general statement of their basis and purpose," 5 U.S.C. § 553(c).

There can be no doubt that all of the foregoing requirements were met here. Indeed, the Court of Appeals itself recognized that the procedural requirements of 5 U.S.C. § 553 were satisfied, 547 F.2d at 643, 653-54 & n. 58; *App.* 43, 67-68 & n. 59; *see also* 547 F.2d at 656 & n. 3; *App.* 79 & n. 3 (Tamm, J., concurring), and this recognition is fully supported by the record.

The notice issued with respect to the rulemaking clearly complied with 5 U.S.C. § 553.[35] As for an "opportunity to

[35] The notice must contain "(1) a statement of the time, place and nature of public rulemaking proceedings [*App.* 358, 361]; (2) a reference to the legal authority under which the rule is proposed [*App.* 360]; and (3) either the terms or substance of the proposed rule or a description of the subjects and issues involved [*App.* 356-58]". 5 U.S.C. § 553(b). The notice in this case fully complied with these requirements and no assertion to the contrary was made to, or by, the Court of Appeals.

participate," the original notice set forth two alternative proposals, *App.* 356-58, provided for a 60-day period for submission of written comments, *App.* 359, and gave notice of an oral hearing at which all persons were invited to present new (or additional) written and oral statements, *App.* 358-59. Many "interested persons" took advantage of these "opportunities." *See App.* 379-84. Written comments were received from a number of individuals and organizations. *App.* 366. In addition, a number of oral presentations were made at the hearing. *App.* 700-1023. Thereafter, the record was held open for an additional thirty days to provide all persons a further opportunity to file supplementary comments, *App.* 367, a further opportunity of which a number of participants (including the intervenors) took advantage. *App.* 367-68. Indeed, the thirty-day period was extended for various persons (including the intervenors) for additional periods of time; and, finally, time was granted for more comments on the supplementary comments. *App.* 368. The "opportunity to participate" was far in excess of that required by the statute.[36]

Finally, there is the matter of the "concise general statement" of "basis and purpose." This Court has suggested that such a statement may be "curt," being required to articulate only the "determinative reason for the final action taken." *See Camp* v. *Pitts,* 411 U.S. 138, 142-43 (1973). The statement made by the Commission far exceeded that stan-

[36] Given what happened at the rulemaking — *viz.*, opportunity to comment *before* the hearing; opportunity to comment *at* the hearing; opportunity to comment *after* the hearing on what had been said before and at the hearing; and, finally, opportunity to comment on the posthearing comments on the prehearing and hearing comments — it is difficult to see how the Court of Appeals perceived the procedures as insufficient to create a "dialogue," even assuming a dialogue was required.

dard. In fact, the Commission's statement of basis and purpose addressed every substantive issue delineated by the Hearing Board[37] and set out reasons for its resolution of each one. Thus, for example, on the issue of sabotage and diversion the Commission noted that the detailed design to protect against such events would be explored in licensing cases involving individual disposal or reprocessing facilities. *App.* 390-91. The Commission pointed out that the adverse environmental effects (radioactive release, in the main) of sabotage and diversion would be comparable to those which would occur in the event of an accident, *App.* 391, and that the environmental effects of accidents had been analyzed in the survey, *App.* 1276-83, 1314-17. Thus, these analyses were found by the Commission to constitute a reasonable representation of the environmental effects which could be expected to occur in the event of sabotage. *App.* 391. On a related point, the Commission stated that it was able to rely on its staff's analysis of environmental effects of the proposed retrievable waste storage facility (although one had never yet been built), because the design and construction of such a facility were within the compass of existing technology based on well-established data and techniques. *App.* 392. The Commission also noted that certain aspects of plutonium handling were not discussed in the survey because plutonium recycling had not yet been undertaken.[38] *App.* 391. Finally, the Commission rejected an argument that Table S-3 should be revised to set out "ranges of releases" on the ground that, given the conservatism of the analysis, the figures given already reflected a greater impact than was actually expected. *App.* 393.

[37] The Commission also addressed the procedural issues presented by the Hearing Board. *See* note 40 *infra.*

[38] See note 13 *supra.*

The Commission's statement of basis and purpose was thus far more than "curt." It dealt with each of the substantive issues which had emerged from the hearing, relevant in whole or in part to the back end of the fuel cycle. In each instance the Commission "indicated the determinative reason for the final action taken." *Camp* v. *Pitts,* 411 U.S. at 142-43. In addition, the Commission noted that future research and technology might produce more precise data or uncover new problems. *App.* 395. The Commission therefore announced its willingness to conduct further proceedings should such additional information develop. *Id.* Indeed, the Commission's rulemaking procedures were remarkably similar to, and, in fact, provided more "opportunity to participate" than, those upheld by this Court in *Florida East Coast*:

> "Here the Commission promulgated a tentative draft of an order, and accorded all interested parties 60 days in which to file statements of position, submissions of evidence, and other relevant observations. The parties had fair notice of exactly what the Commission proposed to do, and were given an opportunity to comment, to object, or to make some other form of written submission. The final order of the Commission indicates that it gave consideration to the statements of the two appellees here. Given the 'open ended' nature of the proceedings, and the Commission's announced willingness to consider proposals for modification after operating experience had been acquired, we think the hearing requirement of § 1(14)(a) of the [Interstate Commerce] Act was met." 410 U.S. at 241-42.[39]

[39] Prior to the above-quoted statement this Court had held that the word "hearing" in § 1(14)(a) of the Interstate Commerce Act which was inserted by amendment in 1966, P.L. 89-430, 80 Stat. 168, was to be construed as having the same meaning as the word "hearing" in 5 U.S.C. § 553. 410 U.S. at 240-41.

B. The Court of Appeals Was Without Authority To Require Additional Procedures

Notwithstanding all of the foregoing, the Court of Appeals held that more was required in order to assure that a "genuine dialogue" was had. The Court of Appeals listed the following "procedural devices" that the Commission might have employed:

> ". . . informal conferences between intervenors and staff, document discovery, interrogatories, technical advisory committees comprised of outside experts with differing perspectives, limited cross-examination, funding independent research by intervenors, detailed annotation of technical reports, surveys of existing literature, memoranda explaining methodology." 547 F.2d at 653; *App.* 67.

These "procedural devices" have at least one thing in common. None of them is mentioned in 5 U.S.C. § 553. That statute requires notice, an opportunity to participate by way of comment, and a concise general statement of basis and purpose, and nothing more is required. *United States* v. *Allegheny-Ludlum Steel Corp.*, 406 U.S. at 758.

This Court has repeatedly refused to impose procedural requirements on agency rulemaking beyond those set out in the plain words of the statute. The wisdom of this position, recently stated unequivocally in *Allegheny-Ludlum* and reiterated in *Florida East Coast,* is confirmed by the Court of Appeals' approach in this case to its own catalogue of "procedural devices." Having propounded its list, the court then observed:

> "It may be that no combination of the procedures mentioned above will prove adequate . . . ." 547 F.2d at 653; *App.* 67.

In this event, the court stated, the Commission might be compelled to surpass the court itself in innovation:

> "[T]he agency will be required to develop new procedures to accomplish the innovative task of implementing NEPA through rulemaking." *Id.*

On the other hand, the court speculated, perhaps nothing new was required at all — simply a greater degree of Commission sensitivity:

> "[T]he procedures the agency adopted in this case, if administered in a more sensitive, deliberate manner, might suffice." *Id.*

All of these contradictory possibilities were put forward, the court said, only because of its concern that the record "disclose a thorough ventilation of the issues." 547 F.2d at 654 n. 58; App. 68 n. 59. No guidance is given, however, as to what constitutes a properly designed ventilator. Nor is there any assurance that any known procedures or techniques can be used to construct the ventilator. The result is a game of judicial Botticelli, in which the Court of Appeals says it is thinking of proper procedures, but will not say what they are.[40] Such a situation cannot be tolerated in the regulation of any industry, particularly when the industry

[40] Before the Hearing Board the intervenors contended that proper resolution of the substantive issues required discovery and cross-examination. *App.* 389. The Commission rejected this contention. As to discovery it pointed out that all pertinent documents, as well as various drafts and handwritten notes, had in fact been made available to all participants several weeks prior to the hearings. *App.* 389-90. With respect to cross-examination, the Commission noted:

> "In our view, the procedures adopted provide a more than adequate basis for formulation of the rule we adopted. All parties were fully heard. Nothing offered was excluded. The record does not indicate that any evidentiary material would have been received under different procedures. *Nor did the proponent of the strict 'adjudicatory' approach make an offer of proof — or even remotely suggest — what substantive matters it would develop under different procedures.*" *App.* 389 (emphasis supplied).

In other words, to use the Court of Appeals' terms, the Commission found that the intervenors had suggested a "procedural device," but had entirely failed to show what additional "ventilation" or "dialogue" would result from the use of the device. Although the

is responsible for a substantial portion of the energy supply of the nation.

The decision of the Court of Appeals represents another in a line of decisions of that court which in substance have held that where full adjudicatory proceedings, *see* 5 U.S.C. §§ 556, 557, are not required by an agency's rulemaking statute, it is nevertheless the function of the reviewing court to determine how much in excess of 5 U.S.C. § 553 "minima" will be required in any given rulemaking.[41] *Allegheny-Ludlum* and *Florida East Coast Railway, supra,* establish beyond any doubt, however, that this "duty" which the Court of Appeals has undertaken, *see* 547 F.2d at 651; *App.* 61, has no basis in the Administrative Procedure Act. Nor does the Constitution impose any such duty; the 5 U.S.C. § 553 procedures for rulemaking impinge upon no constitutional requirement in this setting. *California Citizens Band Ass'n, Inc.* v. *United States,* 375 F.2d 43, 50 (9th Cir.), *cert. denied,* 389 U.S. 844 (1967). *See also Bowles* v. *Willingham,* 321 U.S. 503, 519-20 (1944). The Courts of Appeals are simply not permitted to prescribe additional rule-

Court of Appeals suggested that the intervenors' brief demanding cross-examination and discovery rights and a statement of counsel were "sufficient to focus the agency's attention on Dr. Pittman's testimony as in the category of '"soft" and sensitive subjects and witnesses,' " 547 F.2d at 644 n. 25; *App.* 44-45 n. 25, the court acknowledged that the intervenors did not show the Commission what, if anything, would have been developed by use of further procedures which was impossible to obtain under the procedures actually utilized. *But see International Harvester Co.* v. *Ruckelshaus,* 478 F.2d 615, 631 (D.C. Cir. 1973); *American Airlines, Inc.* v. *CAB,* 359 F.2d 624, 633 (D.C. Cir.) (*en banc*), *cert. denied,* 385 U.S. 843 (1966). *Cf. United States* v. *Florida East Coast Railway Co., supra,* 410 U.S. at 234.

[41] *E.g., Mobil Oil Corp.* v. *FPC,* 483 F.2d 1238, 1251-54 (D.C. Cir. 1973); *Walter Holm & Co.* v. *Hardin,* 449 F.2d 1009, 1015 (D.C. Cir. 1971).

making procedures for federal agencies. *See FPC* v. *Transcontinental Gas Corporation,* 423 U.S. 326 (1976).

The Court of Appeals appears to suggest, nonetheless, that the result may be different when NEPA is involved. *See* 547 F.2d at 645 n. 34, 653; *App.* 48, n. 34, 69. Such a view has been decisively rejected by this Court. This Court's interpretations of the Administrative Procedure Act in *Allegheny-Ludlum* and *Florida East Coast Railway, supra,* were rendered several years after NEPA was enacted. Those were not, it is true, NEPA cases, but this Court has also held that NEPA was not intended to repeal or amend, directly or by implication, any other statute. *United States* v. *SCRAP,* 412 U.S. 669, 694 (1973); *Aberdeen & Rockfish Railroad Co.* v. *SCRAP,* 422 U.S. 289, 319 (1975). *A fortiori,* NEPA cannot provide a basis for reconstituting the fundamental procedural provisions of the Administrative Procedure Act.[42] Just last term this Court stressed that the only procedural requirements imposed by NEPA are those set forth in the specific language of that statute. *Kleppe* v. *Sierra Club,* 427 U.S. 390, 405-06 (1976). The "procedural devices" suggested by the Court of Appeals are, in fact, as foreign to the language of NEPA as to the Administrative Procedure Act itself.

If provision is to be made in the Administrative Procedure Act or NEPA for some proceedings short of full adjudicatory proceedings, 5 U.S.C. §§ 556, 557, but more structured than the rulemaking proceedings described in 5 U.S.C. § 553, the decision to do so is one for the Congress, not the Courts of Appeals. In the absence of any such statutory directive, the Court of Appeals' attempt to place a procedural gloss on NEPA and the Administrative Procedure Act was error.

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[42] Indeed, in their legal brief to the Commission, the intervenors conceded that NEPA provided no legal basis for requiring adjudicatory type hearings. *App.* 1044.

II. THE COURT OF APPEALS ERRED IN HOLDING THAT NEPA REQUIRES CONSIDERATION OF REPROCESSING AND WASTE DISPOSAL IN LICENSING PROCEEDINGS FOR INDIVIDUAL NUCLEAR REACTORS

The Court of Appeals has dictated what the Commission must view as the "proposal" before it, and effectively required that the Commission consider now the environmental effects of certain facilities not yet presented to it. The court's intrusion was two-fold: First, while recognizing that the Commission had discretion to consider waste disposal and reprocessing in generic rulemaking proceedings — and was doing so — the court nonetheless held that the Commission could not proceed with individual reactor licensing until there was a "thorough ventilation" of the waste disposal issue. That is the meaning of the Court of Appeals' remand of Vermont Yankee's licensing order.

The court's second intrusion was, if anything, more serious, for it is clear from the court's opinion that it intended the issue of waste disposal not only to be "ventilated," but essentially to be resolved. That the Court of Appeals was demanding more than mere "ventilation" but rather essential resolution of the waste disposal question is apparent from the court's criticism of the Commission. The Court of Appeals faulted the Commission for not detailing what amounts to an essentially complete design for a retrievable waste storage facility, 547 F.2d at 648-49; *App.* 56, a detailed description of anti-terrorist aspects of such design, 547 F.2d at 650; *App.* 58, and the costs and methods for long-term surveillance of such facilities, 547 F.2d at 650; *App.* 60.

The fact was, however, that the Commission was concerned with the licensing of an individual reactor, not waste

disposal facilities. It was not for the Court of Appeals to redefine the issues before the Commission, nor to dictate the order of their consideration. Such action was especially inappropriate when the agency itself had carefully considered the proper methods of accounting for the environmental effects of waste disposal.

Thus the Appeal Board, exercising the Commission's appellate functions, rejected on two grounds the contention that the environmental effects of the back end of the fuel cycle must be addressed in individual reactor licensing proceedings. First, in the Appeal Board's view, "the proposed action," as used in NEPA, was the licensing of a reactor. The Appeal Board noted that facilities to be used in the back end of fuel cycle were required by the Atomic Energy Act to be licensed separately from the nuclear power reactors which create the spent fuel. *App.* 119. Such "back end" facilities would, at the time of their own individual licensing, be subject to a full environmental review under NEPA. *Id.* The Appeal Board stated:

> "The scope of the inquiry required by [§ 102(2)(C) of NEPA] is repeatedly defined, by the language of that section and as reflected in the language of [Commission regulations], as the impact, the consequences and the alternatives of 'the proposed action', which in the present case is the licensing of a specific nuclear power reactor. The language of Section 102 directs that the environmental statement shall be accomplished 'to the fullest extent possible'. But 'the proposed action' is the licensing of the Vermont Yankee reactor and not of other present and future facilities at other places, to be operated by other firms, and having at best a contingent and presently indefinable relation to this facility." *App.* 119-120.

The second ground relied upon by the Appeal Board was essentially based upon practicality. A proper NEPA analysis only would be possible, the Appeal Board concluded, in

the context of specific reprocessing or disposal facilities. The Appeal Board said:

> "It is evident to us that evaluation of the environmental effects of the operation of one or more unidentifiable reprocessing plants, employing separation processes which are unidentified and which may or may not now be known or used, during the course of the forty-year life of the plant, is not possible at this time and in this proceeding. If the fuel elements of the Vermont Yankee plant pass through the process stream of one reprocessing plant or another now operating or to operate in the future, preceded and followed by the fuel elements and their constituents from other plants, we cannot see how any effect of that process on the environment taking into account the factors enumerated in Subsection 101(b) and Section 102 of [NEPA] can be analyzed except as a part of the integrated analysis of the total operation of that specific reprocessing plant." *App.* 120.[43]

These holdings of the Appeal Board may be taken to be holdings of the Commission itself. *See* pp. 12-13 *supra.* The Commission, however, was itself prepared to go further and, by its generic rulemaking proceeding, attempt to formulate a method for considering in an individual reactor licensing proceeding the marginal environmental effects of the back end of the fuel cycle attributable to that individual reactor. The Commission recognized that such consideration was only possible, or necessary, to a limited extent, *see* pp. 21-23 *supra,* and, like the Appeal Board, it noted that detailed environmental consideration would be given

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[43] The impracticality of such an analysis was also referred to at length by the Licensing Board. See the dialogue between technical member Hall, Chairman Jensch and counsel, *App.* 493-98. Another government agency, EPA, also did not think such discussion, at least as of this time, was practical. *App.* 828-29. As a result, in the rulemaking proceeding EPA opted for an alternative of no discussion of these matters in the environmental impact statement. *App.* 829.

to waste disposal and reprocessing facilities in proceedings for licensing those facilities, *see* p. 33 *supra; App.* 390.

The Court of Appeals flatly rejected the approach of the Commission and its Appeal Board. The notion that environmental review should be confined to "the proposed action," which did not include licensing reprocessing and waste disposal facilities, had already been rejected, the court said, in its decision in *Calvert Cliffs' Coordinating Committee, Inc.* v. *AEC,* 449 F.2d 1109, 1128 (D.C. Cir. 1971). 547 F.2d at 640 & n. 14; *App.* 38 & n. 14. The Court of Appeals characterized the suggestion that waste disposal and reprocessing should be considered in connection with the licensing of waste disposal and reprocessing facilities as "incremental decision-making" forbidden by NEPA. 547 F.2d at 640; *App.* 38. As to the practical difficulties of environmental evaluation outside the ambit of specific proposals, the Court of Appeals was content to rest upon its prior holding in the "*SIPI*" case *Scientists' Institute for Public Information, Inc. (SIPI)* v. *AEC,* 481 F.2d 1079 (D.C. Cir. 1973). The court stated:

> "[I]n *SIPI* . . . we held that the obligation to make reasonable forecasts of the future is implicit in NEPA and therefore an agency cannot 'shirk [its] responsibilities under NEPA by labelling any and all discussion of future environmental effects as "crystal ball inquiry".' 'Meaningful information' concerning the effects of waste reprocessing and disposal technology is presently available, [citing *SIPI*]." 547 F.2d at 639; *App.* 36. *But see App.* 496.

These views are inconsistent with this Court's interpretation of NEPA's requirements. This Court has held that an environmental impact statement may properly be confined to the impact of the proposed action then pending before

the agency, and need not concern itself with other possible proposals which may be considered by the agency for approval in the future. *Kleppe* v. *Sierra Club,* 427 U.S. 390, 410 n. 20, 414-15 & n. 26 (1976). In addition, this Court has recognized that the scope of an environmental impact statement may be limited by practical considerations of feasibility, *Kleppe* v. *Sierra Club,* 427 U.S. at 414, and that the agency's decision on the proper scope of an impact statement should be respected by the courts unless it is arbitrary. *Id.*

The decision of the Court of Appeals, however, would force the Commission, as part of the licensing procedure for a single nuclear reactor, essentially to commence preparation of, and indeed perhaps complete, what amounts to an environmental impact statement for a specific waste storage facility for which no proposal has been made. This contravenes the square holding of *Kleppe* as to the timing of such statements and the degree of agency discretion in connection therewith. The Court of Appeals sought to rely on this Court's statement in *Kleppe* that:

> ". . . when several proposals for coal-related actions that will have cumulative or synergistic environmental impact upon a region are pending concurrently before an agency, their environmental consequences must be considered together." 427 U.S. at 410 (footnote omitted), *quoted in part at* 547 F.2d at 639 n. 12; *App.* 36 n. 12.

However, the portion of *Kleppe* most directly applicable to the matter at hand is that immediately appended to the statement quoted by the Court of Appeals:

> "The statute [NEPA], however, speaks solely in terms of *proposed* actions; it does not require an agency to consider the possible environmental impacts of less imminent actions when preparing the impact statement on

> proposed actions. Should contemplated actions later reach the stage of actual proposals, impact statements on them will take into account the effect of their approval upon the existing environment; and the condition of that environment presumably will reflect earlier proposed actions and their effects." 427 U.S. at 410 n. 20 (emphasis in original).

Thus, this Court made clear that the governing criterion in deciding whether to consider proposals together is the imminence of the federal action. At the time of the *Vermont Yankee* licensing proceeding there were no permanent waste storage facility proposals before the Commission. There were two privately owned waste reprocessing facilities under construction. *App.* 119. Operation of no new fuel reprocessing or waste disposal facility was "imminent" at the time Vermont Yankee was licensed. Indeed, as noted earlier, no reprocessing or permanent (or retrievable) disposal facilities now operate in the United States. *See* p. 10 *supra.*

Finally, the Court of Appeals' decision demonstrates a somewhat cavalier disregard of the Commission's concern with the practical difficulties with respect to present evaluation of future waste disposal. The Appeal Board had held that the back end of the fuel cycle could not be considered meaningfully in the *Vermont Yankee* licensing case or any similar forum. In *Kleppe* this Court observed:

> "The determination of the region, if any, with respect to which a comprehensive statement is necessary requires the weighing of a number of relevant factors, *including the extent of the interrelationship among proposed actions and practical considerations of feasibility.* Resolving these issues requires a high level of technical expertise and is properly left to the informed discretion of the responsible federal agencies. [Citation omitted.] Absent a showing of arbitrary action, we must assume that the agencies have exercised this discretion appropriately." 427 U.S. at 412 (emphasis supplied).

The Appeal Board's decision as to the proper scope of the Vermont Yankee environmental impact statement was hardly arbitrary. It was wholly in line with the Congressional and regulatory history of treating power reactor proposals separately from proposals for facilities involved in the "back end" of the fuel cycle. *See* pp. 46-51, *infra.*

Indeed, given the nature of the actual proposal before it, the Commission's rule was not required at all by NEPA and represents a response to environmental sensitivities beyond the demands of the law. In any event, however, both the rule and the licensing decision recognize the fact that the existence or nonexistence of the Station would not affect the need for disposal facilities one whit as a practical matter. Both recognize the practical impossibility of litigating the issue in any meaningful fashion in the licensing hearing forum. Both recognize that in the absence of a specific proposal for a specific waste disposal and/or reprocessing facility ". . . there is nothing that could be the subject of the analysis envisioned by the statute for an impact statement." *Kleppe* v. *Sierra Club,* 427 U.S. at 401. *Kleppe* requires that, when an agency has thus come to grips with the practical difficulties of fulfilling its NEPA responsibilities (and, indeed, gone further than NEPA would demand), the reviewing court should respect the agency processes.

III. THE LEGISLATIVE HISTORY OF THE ATOMIC ENERGY ACT, CONTINUING CONGRESSIONAL OVERSIGHT, AND THE ENERGY REORGANIZATION ACT OF 1974 DEMONSTRATE A CONGRESSIONAL DETERMINATION THAT REACTOR LICENSING SHOULD PROCEED PRIOR TO RESOLUTION OF THE WASTE DISPOSAL ISSUE

A review of the history of Congressional action with respect to civilian use of nuclear power over a period of more than two decades wholly rebuts any theory that Congress intended NEPA to require reactor licensing to be contingent upon "ventilation" of waste disposal issues, much less resolution of such issues. At the outset of Congress' consideration of civilian use of nuclear reactor technology it was recognized that many unknowns existed and that the nation was embarking on the widespread use of a potentially dangerous technology. The approach suggested by the President and adopted by Congress was to provide extreme flexibility with respect to licensing and regulation,[44] entrusting to an unprecedented degree the decision-making authority as to the direction, speed, and goals of the nuclear energy program to a regulatory agency, while at the same time providing for close oversight of the agency's activities by the Congress.[45] The result, as this Court has long recognized, was a unique relationship between the Commission and the Congress. *Power Reactor Development Co.* v. *International Union of Electrical, Radio and Machine Workers, AFL-CIO,* 367 U.S. 396, 408 (1961).

Congress was fully aware from the outset that use of nuclear reactor technology ineluctably results in the creation

[44] *Message from the President,* H.R. Doc. No. 328, 83d Cong., 2d Sess. 7 (1954).

[45] See 42 U.S.C. §§ 2016, 2252.

of long-lived radioactive materials which represent a potential hazard to mankind and have to be isolated from the biosphere for unprecedented periods of time.[46] Despite these dangers and the absence of any final resolution of the problem, Congress determined to permit civilian use of nuclear technology to go forward. Since the passage of the Atomic Energy Act of 1954, the lack of a decision on the means for final disposition of nuclear waste has been repeatedly brought to the attention of the Congress.[47] Nonetheless Congress has made no suggestion that nuclear power plant licensing should be terminated. Moreover, on numerous occasions since NEPA went into effect on January 1, 1970, at Congressional hearings, Congress was made

[46] In the House Debate on the Atomic Energy Act of 1954 the question of waste disposition and the fact that no certainty existed with respect to a final resolution of the problem were specifically raised. 100 CONG. REC. 14044-45 (Aug. 17, 1954) (Remarks of Rep. Dingell).

[47] For example, the problem of waste disposal was the subject of extensive and exhaustive hearings before a Congressional Subcommittee in 1959. *Hearings on Industrial Radioactive Waste Disposal Before the Special Subcomm. on Radiation of the Joint Comm. on Atomic Energy,* 86th Cong., 1st Sess. *passim* (1959) (5 Vols.). On the first day of the hearings, the following exchange took place between the Subcommittee Chairman and the first witness:

> "REPRESENTATIVE HOLIFIELD. So it would be accurate to say that the problem of permanent disposal of high-level waste has not been solved; that it is in a state of suspension; that we are holding these high-level wastes to the extent of many millions of gallons in a temporary custody type of control and that no decisions have been made as to the final disposal of the high-level wastes.
>
> "DR. WOLMAN. Unless there is some disclosure this week before this committee, which would modify your statement, I would say that that is correct." *Id.* at 10.

No such disclosure took place at these hearings or since then.

fully aware of the progress, or lack thereof, with respect to waste disposal.[48]

Against the background of this continuing flow of information Congress passed the Energy Reorganization Act of 1974.[49] One of the major reasons for the passage of that statute was the desire on the part of the Congress to separate the regulatory from the promotional functions of the old AEC.[50] The legislation was the subject of extensive and wide ranging hearings.[51] During the course of these hearings the status of waste disposal was explored.[52] Despite a full recognition that no waste disposal facilities

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[48] *E.g., Hearings on Civilian Power Reactors before the Joint Comm. on Atomic Energy,* 91st Cong., 2d Sess., Pt. 3, 1423, *et seq.* (1970); *Hearings on Physical Research, Space Nuclear, and Nuclear Waste Management Progress before the Joint Comm. on Atomic Energy,* 92d Cong. 1st Sess., Pt. 3, *passim* (1971); *Hearings on H.R. 13731, H.R. 13732 Before the Joint Comm. on Atomic Energy,* 92d Cong., 2d Sess., Pt. 1, 425*ff.* (1972). *See also Hearings on Environmental Effects of Producing Electric Power before the Joint Comm. on Atomic Energy (Oct. 28, 29, 30, 31; Nov. 4, 5, 6 and 7, 1969, Jan. 27, 28, 29, 30, Feb. 24, 25 and 29, 1970),* 91st Cong., 1st Sess., Pts. 1 and 2 (1970); JOINT COMM. ON ATOMIC ENERGY, 91ST CONG., 1ST SESS., SELECTED MATERIALS ON ENVIRONMENTAL EFFECTS OF PRODUCING ELECTRIC POWER (Comm. Print 1969).

[49] As amended, 42 U.S.C. §§ 5801 *et seq.*

[50] *E.g., Hearings on S. 2744 Before the Subcomm. on Reorganization, Research, and International Organizations of the Senate Comm. on Government Operations,* 93d Cong., 1st Sess. 5, 7 (1973).

[51] *Hearings on S. 2135, S. 2744 Before the Subcomm. on Reorganization, Research and International Organizations of the Senate Comm. on Government Operations,* 93d Cong., 2d Sess. (1974); *Hearings on S. 2744, supra* note 50.

[52] *Hearings on S. 2135, S. 2744, supra* note 51 at 337-47.

existed or were under construction,[53] no moratorium on the licensing of nuclear power was declared or even suggested by the statute. On the contrary, the statute set up a new regulatory agency charged with the duty of regulating nuclear power and having as one of its primary responsibilities the licensing of new nuclear reactors. 42 U.S.C. §§ 5841 *et seq.*

The Court of Appeals, however, reads NEPA as being a Congressional declaration that the nation's entire nuclear

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[53] H. CONF. REP. No. 93-1445, 93d Cong. 2d Sess., 3 1974 U.S. Code Cong. & Ad. News 5538, 5547. *See* S. REP. No. 93-980, 93d Cong., 2d Sess., 3 1974 U.S. Code Cong. & Ad. News 5470, 5521. Indeed, the House Conference Report highlights the fact that Congress was fully aware that no solution to waste disposal was in hand and the language of the statute was specifically altered in light of that fact.

> "In connection with licensing of ERDA facilities used primarily for the receipt and storage of high-level radioactive wastes resulting from licensed activities, the conference substitute follows the Senate language (subsection 203(3)) by deleting that portion of the House language (subsection 202(3)) relating to facilities 'in existence, under construction, or authorized or appropriated for by the Congress, on the date this Act becomes effective.' *The deletion is made because there are no such facilities.*
>
> "The conference substitute also retains the Senate language with respect to licensing of 'retrievable surface storage facilities' and other facilities for long-term storage of high-level radioactive waste. *Such facilities are not now in existence but will be developed in the near future for long-term, possibly permanent, storage of high-level radioactive wastes, including wastes from the licensed sector.*" 3 1974 U.S. Code Cong. & Ad. News at 5547 (emphasis supplied).

Since passage of the Energy Reorganization Act of 1974, Congress has continued its close monitoring of the waste disposal question. *See, e.g., Hearings on Assessing the Policies, Plans and Programs of the Executive Branch and the Nuclear Regulatory Commission for the Safe Storage and Disposal of Radioactive Wastes Produced in the Commercial Nuclear Fuel Cycle, supra* note 12.

power program should be contingent upon full "ventilation" and essential resolution of the waste disposal issue. This reading of NEPA — creating a *de facto* moratorium on nuclear power plant licensing — requires attribution to Congress of an intent to work a massive change in national policy with respect to nuclear power. NEPA's statutory language certainly contains no indication of such an intent. And in the absence of such an indication, in clear terms, none should be inferred. *See Train* v. *Colorado Public Interest Research Group,* 426 U.S. 1, 24 (1976). This Court has observed that "NEPA does not repeal by implication any other statute." *Aberdeen & Rockfish Railroad Co.* v. *SCRAP,* 422 U.S. 289, 319 (1975). *A fortiori,* NEPA cannot be read as practically nullifying statutes passed after its enactment.

In the *Power Reactor* case this Court upheld the Commission's reading of its organic statute as not requiring definitive safety findings prior to issuance of a construction permit. One of the bases for this Court's holding was the fact that Congress' Joint Committee on Atomic Energy had been repeatedly advised of the AEC's construction of its statute and yet the Joint Committee had made no suggestion of change in the AEC's procedure. On the basis of these facts this Court observed:

> "It may often be shaky business to attribute significance to the inaction of Congress, but under these circumstances, and considering especially the peculiar responsibility and place of the Joint Committee on Atomic Energy in the statutory scheme, we think it fair to read this history as a *de facto* acquiescence in and ratification of the commission's licensing procedure by Congress." 367 U.S. at 409.

With respect to waste disposal the history is not merely one of Congressional inaction, but of the enactment by Congress, with full appreciation of the status of waste disposal, of legislation contemplating contemporaneous and continued licensing of nuclear power plants. Such legislation was passed almost five years after the enactment of the statute (NEPA) which the Court of Appeals has construed to make all such licensing contingent upon resolution of the waste disposal issue. Given this history, the Court of Appeals' construction of NEPA cannot stand.

IV. THE DECISION OF THE COURT OF APPEALS CONSTITUTES A SUBSTITUTION BY THAT COURT OF ITS JUDGMENT FOR THAT OF THE EXPERT COMMISSION IN TECHNICAL MATTERS COMMITTED BY CONGRESS TO THE COMMISSION'S DISCRETION

A. Introduction

Although the Court of Appeals couched its opinion in terms of supposed procedural defaults and gaps in the rulemaking record, in fact the court's decision constitutes a wholesale substitution of judicial judgment for that of the Commission. The defects which the court perceived in the Commission's rulemaking proceeding either did not exist in fact or did not constitute defects as a matter of law.

The specific faults in the rulemaking proceeding which the Court of Appeals detailed in its corrected opinion were: first, a number of failures in the Environmental Survey to discuss specific matters which the Court of Appeals deemed essential, 547 F.2d at 649-51; *App.* 56-61; and, second, a supposed self-interest on the part of one witness, Dr. Pittman, 547 F.2d at 647 n. 43; *App.* 52 n. 43. There were no other grounds given in the court's corrected opinion for its dissatisfaction with the Commission.[54] In fact, however, the

[54] However, in its original opinion the court referred repeatedly to an alleged failure by the Hearing Board to question Dr. Pittman,

record before the Commission discloses an ample basis for its decision.

B. The Alleged Gaps in the Rulemaking Record Found by the Court of Appeals Provide No Basis for the Result Reached

The Court of Appeals referred to a number of items which the court said were not discussed in the rulemaking record but, apparently in its view, should have been. These "gaps" either (1) resulted from the fact that meaningful information would only be available in the context of a specific waste disposal facility proposal; (2) were filled by Dr. Pittman's answers to Hearing Board questions; (3) were such that the filling of them was unnecessary to the decision to be made; or (4) did not, in fact, exist.

After stating that a portion of Dr. Pittman's testimony was basically a description of the retrievable surface storage facility, accompanied by several schematic drawings, the Court of Appeals said:

> "These show the facility will have a cooling system, a transfer area and storage basins, but do not attempt to describe how they will be built and operated, what materials will be used, where such a facility might be located, or what it might cost to build and operate." 547 F.2d at 648-49; *App.* 56.

At another point in the opinion, the following appears:

> "Other than the broad reference to 'structural strength, plant security, etc., to withstand credible overt forces of

App. 61 & n. 53, 68 n. 59, and suggested a supposed disparity in the Hearing Board's treatment of Dr. Pittman and the respondents' witnesses, *App.* 61 n. 53, 547 F.2d at 650 n. 50; *App.* 58-59, n. 50. This suggestion, and most, but not all, of the references to the supposed failure to question, were removed by the court's order of correction. *App.* 88.

> man', there is no discussion of how the facility would be protected from terrorism." 547 F.2d at 650; *App.* 58.

And in further criticism of the discussion of the storage facility, the Court of Appeals stated:

> "There is no discussion of how 'adequate human surveillance and maintenance' can be assured for the periods involved, nor what the long term costs of such a commitment are, nor of the dangers if surveillance is not maintained." 547 F.2d at 650; *App.* 60.

All of these criticisms call for types of information which by their very nature are design and site specific. The Environmental Survey, however, was not intended to be, indeed could not be, design or site specific. *App.* 760-61. The Court of Appeals' criticisms point up the wisdom of the principle, enunciated by this Court, in *Kleppe,* that in the absence of a specific proposal ". . . there is nothing that could be the subject to the analysis envisioned by [NEPA] for an impact statement." 427 U.S. at 401. Neither the Pittman testimony nor the rulemaking proceeding as a whole was intended to finalize a storage facility design. NEPA does not require the commencement or writing of what amounts to a full environmental impact statement for such a facility at this juncture and, indeed, leaves to the Commission's discretion the timing of such a process. *Kleppe* v. *Sierra Club,* 427 U.S. at 404-406.

In any event, with respect to the storage facility, Dr. Pittman made clear in answering questions put by the Hearing Board why the details of design and construction were not of concern to the issue at hand.[55] In response to questions

[55] The Court of Appeals was unaware of the Pittman dialogue when it first issued its decision. *Compare App.* 61 & n. 53, 68 n. 59 *with App.* 88. The court also appears to have been unaware of the oral testimony of Mr. Smiley of the Commission staff. The Court of Appeals referred to a lack of discussion concerning pro-

by Board Member Steindler, Dr. Pittman explained that the construction of the retrievable surface storage facility required no new technology. *App.* 831-32. The facility could be constructed entirely on the basis of existing materials and methods.[56] *Id.* This testimony was never challenged, and on that basis the Commission properly concluded that the storage facility could be constructed and would perform in a way providing reasonable assurance that its quantifiable environmental impacts would not exceed those set out in Table S-3. *App.* 391-92.

The Court of Appeals discussed at some length the possibility of a "meltdown," which could occur if cooling capa-

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tection of storage facilities from terrorism. 547 F.2d at 650; *App.* 58. However, in response to Hearing Board questions arising out of the testimony of Dr. Kendall for the intervenors, Mr. Smiley testified at length on the problem of "safeguards" in light of Dr. Kendall's expressed concern about diversion of nuclear materials by terrorists at some point in the fuel cycle. *App.* 922-30. Mr. Smiley's testimony was not design specific, but he persuasively articulated a basis for the staff's view (apparently adopted by the Commission) that safeguarding the fuel cycle from terrorism was feasible using current security precautions. To the extent he and a colleague listed specific methods and devices in connection with fuel reprocessing facilities, *App.* 924, 929-30, such methods or adaptions thereof would, of course, be effective at any facility at any point in the fuel cycle, including the temporary storage facility.

[56] Indeed, the consensus among knowledgeable persons appears to be that technologies exist to ensure proper long term disposal of nuclear waste. What remains for government decision makers is to make the optimum choice among the capable and available technologies. *See App.* 969; *Hearings on Assessing the Policies, Plans, and Programs of the Executive Branch and the Nuclear Regulatory Commission for the Safe Storage and Disposal of Radioactive Wastes Produced in Commercial Nuclear Fuel Cycle, supra,* note 12 at 23 (remarks of Secretary Elliot L. Richardson). Similarly it should be noted that the technology for storing plutonium also exists at this time. *App.* 815.

bility were lost at a storage facility. 547 F.2d at 649-50; *App.* 56-59. The Court of Appeals first stated:

> "Decaying radioactive waste spontaneously gives off substantial heat and '[s]hould adequate provisions not be made to remove this heat . . . , the waste and the canister would melt.' [Record cite.] A 'meltdown' would result in what Dr. Pittman calls a 'situation of considerable concern,' which would involve the 'loss of some fraction of the isolation of the radioactive material from the environment.' [Record cite.] No attempt is made to describe how serious a radioactivity hazard would be presented." 547 F.2d at 649; *App.* 56.

The court also faulted the Commission for not supplying citations to its own "studies" of heat removal methods it had done which had served to permit a conclusion that water or air was the best transfer medium for such systems. 547 F.2d at 649; *App.* 56. And, after quoting at length Dr. Pittman's reasons for concluding that a meltdown is an incredible event,[57] 547 F.2d at 649-50; *App.* 57-58,

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[57] Dr. Pittman explained that, in order for a meltdown to occur, it would be necessary to have a complete cooling system failure. This could only occur if redundant (*i.e.*, additional and duplicate as to function) essential systems all failed, which was unlikely in light of the specifications to which the facility would be built, including designing for earthquake and tornado loads and anti-terrorist features. *App.* 782. In addition, modular construction would subject only a small number of canisters full of waste to any single event. Having pointed out the unlikelihood that the prerequisite cooling system failure would occur to begin with, Dr. Pittman then noted that even if this occurred, 16 hours would elapse before the cooling water would begin to boil away, that a week would be needed to boil all the water away, and that then an additional day of no water would be required before melting would commence. Thus over eight days would be available to repair the cooling system before melt would commence. *App.* 782-83. On this basis, Dr. Pittman concluded, and properly so, that:

> "The number of sequential failures required of highly reliable systems, combined with the long periods available for repair and recovery from each, result in the judgment that this is an incredible accident." *App.* 783.

the Court of Appeals complained that Dr. Pittman's conclusions were "unadorned," 547 F.2d at 650; *App.* 58, and that he had not explained the "[v]arious corrective measures" which could be taken to prevent meltdown in the event of cooling system failure. 547 F.2d at 650; *App.* 59.

Again the answer to the Court of Appeals' concerns begins with the Pittman answers to Hearing Board questions. Dr. Pittman testified in response to Board Member Steindler:

> "There is nothing new being developed in the engineered storage facility. We are looking at better techniques of removing the heat than may be (sic) used before. *But it is purely an engineering application of a known technology we are using.*" *App.* 832 (emphasis supplied).

Thus the Commission could, and did, recognize the following facts: First, proper and redundant heat cooling systems can be built with known technology. Second, even if the highly unlikely total failure of redundant systems occurred there would be a period of eight days to fix the cooling system before melt would occur.[58] On this basis the "meltdown" was considered incredible.

As to the Court of Appeals' complaint that the seriousness of the environmental impact of a meltdown is not detailed, the short answer is that proper NEPA analysis requires no such detail. The construction of a storage facility does not create an accident, it creates the "risk" of an accident. This creation of a risk (not the happening of the accident) is the environmental "impact" of the "proposed action." Thus, the Commission has long analyzed the environmental impact of possible reactor "accidents" by

[58] *Supra* note 57. It should be kept in mind that any cooling system in any setting is nothing but pumps, valves, conduits, and heat exchangers. Cooling systems are not complex mechanisms. *See App.* 796, 798.

balancing the likelihood of the accident occurring against the impact which would result. This requires no analysis of the incredible (so-called Class 9) accident which has the potential for extremely serious environmental consequences but which has a vanishingly small probability of occurrence.[59] This approach has received judicial sanction, *Carolina Environmental Study Group* v. *United States*, 510 F.2d 796, 799 (D.C. Cir. 1975); *see also Ecology Action* v. *AEC*, 492 F.2d 998, 1002 (2d Cir. 1974), and properly so. And it is precisely this approach that was followed by the Commission in the Environmental Survey.

The Court of Appeals expressed displeasure that the Environmental Survey contained no discussion of "other acceptable geological disposal concepts," in addition to burial in salt beds, which the Commission has under consideration. 547 F.2d at 651; *App.* 60-61. It may be that this concern was another aspect of the court's interest in ventilation, since, later in its opinion, the court recognized that there was no need to consider alternate disposal methods if the currently proposed method is given a conservative and credible assessment. 547 F.2d at 653 n. 57; *App.* 67 n. 58. In a similar vein the court faulted the Commission for not explaining what subsequent events had caused the Commission to defer construction of a salt bed repository beyond the mid-1970's, 547 F.2d at 648; *App.* 54, and questioned Dr. Pittman's "optimism" concerning the bedded salt concept, 547 F.2d at 650-51; *App.* 60. It is difficult to see how such a discussion is relevant to the particular subject of the Environmental Survey. In any event, as the opinion itself reveals, 547 F.2d at 648 n. 46; *App.* 54 n. 46, the problem which mandated deferral at the time was the geology of specific sites which were considered, not the concept of using bedded salt.[60]

[59] *See* Proposed Annex to 10 C.F.R. 50, App. D, 36 Fed. Reg. 22851 (Dec. 1, 1971).

[60] Indeed the intervenors, in their comments following the oral hearing agreed that "bedded salt" was a "quite promising" concept

As seen from the foregoing, the specific "gaps" referred to by the Court of Appeals cannot, on any fair reading of the record, be said to undercut the ultimate result reached by the Commission. None of the additional information sought by the Court of Appeals was necessary for the rule to "pass muster" under the Administrative Procedure Act and the absence of any or all of such information is not fatal to the environmental analysis even assuming any was required by NEPA at the time.

C. Insofar as the Court of Appeals' Decision is Based Upon Its Holding that Dr. Pittman's Position Undermined His Credibility, it is in Error

In a footnote to its description of Dr. Pittman's position as head of the Commission's division responsible for development, construction, and operation of waste storage facilities the Court of Appeals states:

> "In *Portland Cement Ass'n* v. *Ruckelshaus,* [486 F.2d 375, 400 n. 95 (D.C. Cir. 1973), *cert. denied,* 417 U.S. 921 (1974)], the court pointed out that when a 'principal source of reliance by the agency' was 'peculiarly subject to considerations of self-interest, more might be required than mere comments.' Evaluation of a program by the in-house staff member charged with responsibility for administering it falls within the intendment of that statement." 547 F.2d at 647 n. 43; *App.* 52 n. 43.

This amounts to a holding that an agency must apply a more rigorous than normal test of credibility to testimony

for so much of the high-level waste as was comprised of fission products. *App.* 1093. The intervenors did argue that salt beds were not the best choice for "transuranics," *e.g.*, Pu^{239}. However, the waste disposal Dr. Pittman was dealing with assumed reprocessing which means not disposing of the transuranics but recovery and use thereof. *See* pp. 9-10 *supra.* Thus in the context of the rulemaking Dr. Pittman's "optimism" about the use of salt, *see* 547 F.2d at 650-51; *App.* 60, was shared by all parties, including the intervenors.

of its own staff personnel if those personnel have significant administrative responsibilities in the areas about which they are testifying.

There is no basis in law for such a rule. Indeed the usual practice is that public officials testifying within their expertise are, if anything, to be accorded greater deference than other witnesses. *See Pell* v. *Procunier,* 417 U.S. 817, 827 (1974); *Saxbe* v. *Washington Post Co.,* 417 U.S. 843, 849 (1974). Certainly its own earlier decision cited by the Court of Appeals *(Portland Cement)* provides no basis for the rule espoused. In *Portland Cement* the evidence which was characterized as possibly tainted by self-interest concerned the ability of certain emission control devices to meet federal standards. That evidence had been furnished by officers of private companies which were the vendors of such equipment, *i.e.,* by parties and individuals with a direct financial interest in the decision of the agency. Dr. Pittman had no financial or other discernible interest whatsoever which would be served or thwarted by any given decision by the Commission with respect to the rulemaking. Indeed, Dr. Pittman, by virtue of his position as a member of the Commission's staff, had only one duty or interest in the proceeding, the representation of the public interest.[61]

Indeed, even if the Court of Appeals' novel formulation of the standard of credibility to be applied to agency per-

[61] This court has observed that "... no man is an absolutely disinterested witness where his testimony relates to the question of the performance or non-performance of a duty which he owed on account of the position which he occupied." *Texas & Pacific Railway Co.* v. *Carlin,* 189 U.S. 355, 361 (1903). However, Dr. Pittman's performance of his duties was not at issue in this proceeding. His function was to opine on the feasibility and effects of a certain type of waste facility.

sonnel were good law, the court had no right to reverse the Commission's decision because of the court's judgment that Dr. Pittman was not credible. This Court has made clear that the right of a reviewing court to substitute its judgment for that of an agency with respect to the credibility of testimony is extremely narrow. Credited testimony should be rejected only if the record reveals that the testimony "carries its own death wound." *NLRB* v. *Pittsburgh S.S. Co.*, 337 U.S. 656, 660 (1949). Dr. Pittman's testimony hardly "carries its own death wound". Indeed, it stands unchallenged in the record.

Thus, to the extent the Court of Appeals' decision rests upon its view that the credibility of Dr. Pittman's testimony could be questioned because of his employment, the decision was based upon an erroneous view of the law of evidence, and, in addition, constituted an impermissible substitution of the court's judgment for that of an agency. Particularly is this so where, as here, the matters which the agency and its staff were addressing were of a highly technical nature and fell squarely within the ambit of the agency's competence. *See FPC* v. *Florida Power & Light Co.*, 404 U.S. 453, 463-64 (1972).

D. The Record Rebuts the Court of Appeals' Generalized Criticisms of the Commission's Reliance on its Staff Including Dr. Pittman

The most oft repeated chastisement of the Commission's conduct of the rulemaking proceeding in the Court of Appeals' decision, as originally issued, was an alleged failure on the part of the Hearing Board to question Dr. Pittman. *App.* 61 & n. 53; *App.* 68 n. 59. *See also App.* 62, 65, 66. Three direct references to this supposed fact were made. After a lengthy description and characterization of

the Pittman testimony, *App.* 52-61, the Court of Appeals stated:

> "When Dr. Pitman finished, no questions were put to him by the hearing board." *App.* 61.

To this statement was appended a footnote:

> "One short comment was made concerning commercial disposal of low-level waste, [record citation omitted], as was the observation, quoted *supra,* note 48, regarding failure to provide back-up documentation.
>
> "The board's quiescence regarding Dr. Pittman is in marked contrast to its often hostile questioning of expert witnesses for the intervenors. See, *e.g., supra* note 50." *App.* 61 n. 53.

The third direct reference to the supposed lack of questioning of Dr. Pittman appears in a footnote in which the Court of Appeals, *inter alia,* distinguished the facts in the case before it from those involved in its earlier decision in *International Harvester Co.* v. *Ruckelshaus,* 478 F.2d 615 (D.C. Cir. 1973). *App.* 68 n. 59. Acknowledging that the Commission's rulemaking procedures in this case were "virtually identical on paper" with those approved in *International Harvester,* the Court of Appeals said:

> "However in practice the procedures were administered quite differently in International Harvester: '[T]he hearing officers did not propound the pre-submitted questions like robots; they were charged with conducting a hearing for the purpose of focusing information needed for decision and they quite appropriately "followed up" on questions.' [478 F.2d at 631]. *In this case the board members asked no questions whatsoever of Dr. Pittman. See supra,* note 53." *App.* 68 n. 59. (Emphasis supplied.)

That the alleged failure of the Hearing Board to question Dr. Pittman was the gravamen of the decision as originally written is apparent from the "indirect" references in the opinion to this fact. The Court of Appeals' opinion con-

tains a lengthy listing of supposedly significant and unanswered questions, 547 F.2d at 648-51; *App.* 54-61, arising out of the court's reading of the waste management section of the Environmental Survey which was "based on Dr. Pittman's statement," 547 F.2d at 651; *App.* 61. This is followed by a statement that the court did not dispute the conclusions. *Id.* However, the Court of Appeals held that it could not uphold these conclusions because the reasoning and data supporting them were not "spread out in detail." *Id.* There then appears the following basis for rejecting the Pittman testimony as an adequate foundation for the Commission's rule:

> "The problem with the conclusory quality of Dr. Pittman's statement — *and the complete absence of any probing of its underlying basis* — is that it frustrates oversight by anyone: Commission, intervenors, court, legislature or public. *Given the opportunity, Dr. Pittman might have provided convincing answers to many of the questions which his statement leaves untouched. Since that did not occur, however,* his judgments must either be accepted at face value, or rejected out of hand." 547 F.2d at 651; *App.* 61-62. (Emphasis supplied.)

Subsequently, after its discussion of the Commission's supposedly summary treatment of the waste disposal issues designated in the Hearing Board report, the Court of Appeals concluded that the Commission's action could not "pass muster as reasoned decision making", 547 F.2d at 653; *App.* 66, because:

> "In substantial part, the materials *uncritically relied on by the Commission* in promulgating this rule consist of extremely vague assurances by agency personnel that problems as yet unsolved will be solved. That is an insufficient record to sustain a rule limiting consideration of the environmental waste disposal to the numerical values in Table S-3 . . . . *Not only were the generalities relied on in this case not subject to rigorous probing — in any form* — but when apparently substantial criticism

> were brought to the Commission's attention, it simply ignored them, or brushed them aside without answer." 547 F.2d at 653; *App.* 65-66.

After the decision was issued the Commission filed with the Court of Appeals a Motion for Stay of Mandate and Correction of the Opinion. *App.* 4. The Commission pointed out that Dr. Pittman had in fact been questioned by the Hearing Board and attached the relevant portions of the rulemaking transcript. *App.* 830-35. The Court of Appeals responded with a *per curiam* order which deleted only what have been referred to above as the three "direct" references to the alleged failure of the Hearing Board to question Dr. Pittman. *App.* 88. In particular, the textual statement appearing at the close of the description of the Pittman statement (*App.* 61, quoted *supra,* p. 60) was deleted. All of original footnote 53 (quoted *supra,* p. 60) was deleted. And the last sentence of the paragraph discussing *International Harvester* in original footnote 59 (quoted *supra,* p. 61 with emphasis) was deleted. No changes were made in what have been referred to above as the "indirect" references.

At this juncture it should be noted that, in and of themselves, the deletions made cast substantial doubt upon the reasoning behind significant portions of the decision as originally issued. The deletion of original footnote 53 removes the charge that the Hearing Board treated the respondents' witnesses in a manner disparate from those of the Commission staff.[62] Thus the result reached by the

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[62] The suggestion that the Commission had accorded disparate treatment to the respondents' witnesses had no basis in fact. The Court of Appeals made the charge on the basis of a colloquy involving the Hearing Board Chairman, a witness, and one of the intervenors' attorneys. *App.* 58-59, n. 50. This exchange is later offered as an example of the Hearing Board's "often hostile questioning of expert witnesses by the intervenors." *App.* 61 n. 53

Court of Appeals can no longer be upheld on the theory that the intervenors were somehow treated unfairly or like "interlopers." See *Office of Communication of the United Church of Christ* v. *FCC*, 425 F.2d 543 (D.C. Cir. 1969). Second, the deletion of the sentence from the paragraph in original footnote 59 (now 547 F.2d at 654, n. 58) discussing *International Harvester* removes the Court of Appeals' only articulated basis for distinguishing the two cases.

Prescinding from the foregoing, these deletions severely undercut the basic rationale of the entire decision. The Court of Appeals provided no new explanation for distinguishing *International Harvester*. Thus, assuming *International Harvester* to be good law, reversal is required. Nor did the Court of Appeals explain why the "indirect references," to the failure to question Dr. Pittman, which are key to the result reached, had continued validity. This failure to explain itself admits of only two possible explanations. First, there is no basis for treating these key statements as still valid, or, second, that the statements are still valid because in the Court of Appeals' judgment the questioning was not "probing" or "rigorous" enough or not properly directed. If the former explanation is true, reversal is required. If the latter is the explanation, it can-

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(now withdrawn). The supposedly "hostile" exchange quoted in n. 50 by the Court of Appeals is quoted in a truncated version. We invite this Court's attention to the full record of the exchange. *App.* 907-10. A review of that portion of the record reveals a courteous inquiry by the Chairman on the issue of whether the question of terrorist activity was beyond the scope of the rulemaking in light of the limits the Commission had set in the notice of the proceeding. The Chairman clearly stated that his question was not to be construed as technical interrogation and he made clear his worry was the Board's jurisdiction to explore the issue.

not stand. Such a holding is a clear substitution by the Court of Appeals of its judgment for that of the Commission and its Hearing Board (which included two technical members) as to what questioning of Dr. Pittman was necessary to assure that Dr. Pittman's statement was correct on technical matters. In short, the Court of Appeals was no longer basing its result on a procedural deficiency, but rather upon its view of what information an expert Board needs in order to assure itself of the validity of data or testimony it is relying on. In so doing the Court of Appeals invaded an area committed to the agency's discretion; this mandates reversal of that court's decision.

V. THE COURT OF APPEALS ERRED IN BASING FINDINGS AND CONCLUSIONS UPON ARTICLES PUBLISHED LONG AFTER THE RULEMAKING CLOSED

A remarkable aspect of the Court of Appeals' lengthy criticism of Dr. Pittman, 547 F.2d at 648-51; *App.* 55-61, is that the court relies upon no evidence in the record of the rulemaking as conflicting with Dr. Pittman's testimony. Rather the closest things to "factual" bases for the Court of Appeals' criticisms are a number of articles cited by the court in various footnotes. 547 F.2d at 648 nn. 46 & 47, 650 n. 51, 651 n. 52; *App.* 54 n. 46, 55 n. 47, 60 n. 51; 60 n. 52. All of the articles were published in 1975, two years after the rulemaking hearing and, in most cases, over a year after the rule was promulgated. Each of these articles was treated by the Court of Appeals in its analysis as if it were as much a part of the agency record as Dr. Pittman's uncontradicted testimony. In *FPC* v. *Transcontinental Gas Corporation*, 423 U.S. 326 (1976), this Court observed:

> ". . . we have consistently expressed the view that ordinarily review of administrative decisions is to be confined to 'consideration of the decision of the agency and of the

> evidence on which it was based.' *United States* v. *Carlo Bianchi & Co.*, 373 U.S. 709, 714-15 (1963). '[T]he focal point for judicial review should be the administrative record already in existence, *not some new record made initially in the reviewing court.' Camp* v. *Pitts*, 411 U.S. 138, 142 (1973)." 423 U.S. at 331-32 (emphasis supplied).

In the case at bar, the record, at least insofar as it was used to show controversy with Dr. Pittman was not made "in the reviewing court," it was made *by* the reviewing court. Such a practice has no basis in law and should not be sanctioned by this Court.

CONCLUSION

The decision of the Court of Appeals on review in *Vermont Yankee,* No. 76-419, should be reversed.

Respectfully submitted,

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STATUTES AND REGULATIONS INVOLVED

Administrative Procedure Act, 5 U.S.C. § 553

(a) This section applies, according to the provisions thereof, except to the extent that there is involved —

(1) a military or foreign affairs function of the United States; or

(2) a matter relating to agency management or personnel or to public property, loans, grants, benefits, or contracts.

(b) General notice of proposed rule making shall be published in the Federal Register, unless persons subject thereto are named and either personally served or otherwise have actual notice thereof in accordance with law. The notice shall include —

(1) a statement of the time, place, and nature of public rule making proceedings;

(2) reference to the legal authority under which the rule is proposed; and

(3) either the terms or substance of the proposed rule or a description of the subjects and issues involved.

Except when notice or hearing is required by statute, this subsection does not apply —

(A) to interpretative rules, general statements of policy, or rules of agency organization, procedure, or practice; or

(B) when the agency for good cause finds (and incorporates the finding and a brief statement of reasons therefor in the rules issued) that notice and public procedure thereon are impracticable, unnecessary, or contrary to the public interest.

(c) After notice required by this section, the agency shall give interested persons an opportunity to participate in the rule making through submission of written data, views, or arguments with or without opportunity for oral presentation. After consideration of the relevant matter presented,

the agency shall incorporate in the rules adopted a concise general statement of their basis and purpose. When rules are required by statute to be made on the record after opportunity for an agency hearing, sections 556 and 557 of this title apply instead of this subsection.

(d) The required publication or services of a substantive rule shall be made not less than 30 days before its effective date, except —

(1) a substantive rule which grants or recognizes an exemption or relieves a restriction;

(2) interpretative rules and statements of policy; or

(3) as otherwise provided by the agency for good cause found and published with the rule.

(e) Each agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule. Pub.L. 89-554, Sept. 6, 1966, 80 Stat. 383.

Atomic Energy Act of 1954

"CHAPTER 1. DECLARATION, FINDINGS, AND PURPOSE

Declaration. 42 U.S.C. sec. 2011.

"SECTION 1. DECLARATION. — Atomic energy is capable of application for peaceful as well as military purposes. It is therefore declared to be the policy of the United States that —

"a. the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security; and

"b. the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.

Findings. 42 U.S.C. sec. 2012.

"SEC. 2. FINDINGS. — The Congress of the United States hereby makes the following findings concerning the development, use, and control of atomic energy:

"a. The development, utilization, and control of atomic energy for military and for all other purposes are vital to the common defense and security.

"c. The processing and utilization of source, byproduct, and special nuclear material affect interstate and foreign commerce and must be regulated in the national interest.

"d. The processing and utilization of source, byproduct, and special nuclear material must be regulated in the national interest and in order

to provide for the common defense and security and to protect the health and safety of the public.

"e. Source and special nuclear material, production facilities, and utilization facilities are affected with the public interest, and regulation by the United States of the production and utilization of atomic energy and of the facilities used in connection therewith is necessary in the national interest to assure the common defense and security and to protect the health and safety of the public.

"f. The necessity for protection against possible interstate damage occurring from the operation of facilities for the production or utilization of source or special nuclear material places the operation of those facilities in interstate commerce for the purposes of this Act.

"g. Funds of the United States may be provided for the development and use of atomic energy under conditions which will provide for the common defense and security and promote the general welfare.

"i. In order to protect the public and to encourage the development of the atomic energy industry, in the interest of the general welfare and of the common defense and security, the United States may make funds available for a portion of the damages suffered by the public from nuclear incidents, and may limit the liability of those persons liable for such losses.

Purpose.
42 U.S.C.
sec. 2013.

"SEC. 3. PURPOSE. — It is the purpose of this Act to effectuate the policies set forth above by providing for —

"a. a program of conducting, assisting, and fostering research and development in order to encourage maximum scientific and industrial progress;

"b. a program for the dissemination of unclassified scientific and technical information and for the control, dissemination, and declassification of Restricted Data, subject to appropriate safeguards, so as to encourage scientific and industrial progress;

"c. a program for Government control of the possession, use, and production of atomic energy and special nuclear material, whether owned by the Government or others, so directed as to make the maximum contribution to the common defense and security and the national welfare, and to provide continued assurance of the Government's ability to enter into and enforce agreements with nations or groups of nations for the control of special nuclear materials and atomic weapons.

"d. a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with the health and safety of the public;

"e. a program of international cooperation to promote the common defense and security and to make available to cooperating nations the benefits of peaceful applications of atomic energy as widely as expanding technology and considerations of the common defense and security will permit; and

"f. a program of administration which will be consistent with the foregoing policies and programs, with international arrangements, and with agreements for cooperation, which will enable the Congress to be currently informed so as to take further legislative action as may be appropriate.

"CHAPTER 16. JUDICIAL REVIEW AND ADMINISTRATIVE PROCEDURE

General.
80 Stat. 381-388, 5 U.S.C. 551-559.
42 U.S.C. sec. 2231.

"SEC. 181. GENERAL. — The provisions of the Administrative Procedure Act (Public Law 404, Seventy-ninth Congress, approved June 11, 1946) shall apply to all agency action taken under this Act, and the terms 'agency' and 'agency action' shall have the meaning specified in the Administration Procedure Act: *Provided, however,* That in the case of agency proceedings or actions which involve Restricted Data or defense information, the Commission shall provide by regulation for such parallel procedures as will effectively safeguard and prevent disclosure of Restricted Data or defense information to unauthorized persons with minimum impairment of the procedural rights which would be available if Restricted Data or defense information were not involved.

License applications.
42 U.S.C. sec. 2232.

"SEC. 182. LICENSE APPLICATIONS. —

"a. Each application for a license hereunder shall be in writing and shall specifically state

such information as the Commission, by rule or regulation, may determine to be necessary to decide such of the technical and financial qualifications of the applicant, the character of the applicant, the citizenship of the applicant, or any other qualifications of the applicant as the Commission may deem appropriate for the license. In connection with applications for licenses to operate production or utilization facilities, the applicant shall state such technical specifications, including information of the amount, kind, and source of special nuclear material required, the place of the use, the specific characteristics of the facility, and such other information as the Commission may, by rule or regulation, deem necessary in order to enable it to find that the utilization or production of special nuclear material will be in accord with the common defense and security and will provide adequate protection to the health and safety of the public. Such technical specifications shall be a part of any license issued. The Commission may at any time after the filing of the original application, and before the expiration of the license, require further written statements in order to enable the Commission to determine whether the application should be granted or denied or whether a license should be modified or revoked. All applications and statements shall be signed by the applicant or licensee. Applications for, and statements made in connection with, licenses under sections 103 and 104 shall be made under oath or affirmation. The Commission may require any other applications or statements to be made under oath or affirmation.

ACRS Report.

"b. The Advisory Committee on Reactor Safeguards shall review each application under section 103 or section 104 b. for a construction permit or an operating license for a facility, any application under section 104 c. for a construction permit or an operating license for a testing facility, any application under section 104 a. or c. specifically referred to it by the Commission, and any application for an amendment to a construction permit or an amendment to an operating license under section 103 or 104 a., b., or c. specifically referred to it by the Commission, and shall submit a report thereon which shall be made part of the record of the application and available to the public except to the extent that security classification prevents disclosure.

Commercial power.

"c. The Commission shall not issue any license under section 103 for a utilization or production facility for the generation of commercial power until it has given notice in writing to such regulatory agency as may have jurisdiction over the rates and services incident to the proposed activity; until it has published notice of the application in such trade or news publications as the Commission deems appropriate to give reasonable notice to municipalities, private utilities, public bodies, and cooperatives which might have a potential interest in such utilization or production facility; and until it has published notice of such application once each week for four consecutive weeks in the Federal Register, and until four weeks after the last notice.

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"d. The Commission, in issuing any license for a utilization or production facility for the generation of commercial power under section 103, shall give preferred consideration to applications for such facilities which will be located in high cost power areas in the United States if there are conflicting applications for a limited opportunity for such license. Where such conflicting applications resulting from limited opportunity for such license include those submitted by public or cooperative bodies such applications shall be given preferred consideration.

"SEC. 183. TERMS OF LICENSES. — Each license shall be in such form and contain such terms and conditions as the Commission may, by rule or regulation, prescribe to effectuate the provisions of this Act, including the following provisions:

Terms of licenses. 42 U.S.C. sec. 2233.

"b. No right to the special nuclear material shall be conferred by the license except as defined by the license.

"c. Neither the license nor any right under the license shall be assigned or otherwise transferred in violation of the provisions of this Act.

"d. Every license issued under this Act shall be subject to the right of recapture or control reserved by section 108, and to all of the other provisions of this Act, now or hereafter in effect and to all valid rules and regulations of the Commission.

Inalienability of licenses. 42 U.S.C. sec. 2234.

"SEC. 184. INALIENABILITY OF LICENSES.— No license granted hereunder and no right to utilize or produce special nuclear material granted hereby shall be transferred, assigned or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person, unless the Commission shall, after securing full information, find that the transfer is in accordance with the provisions of this Act, and shall give its consent in writing. The Commission may give such consent to the creation of a mortgage, pledge, or other lien upon any facility or special nuclear material, owned or thereafter acquired by a licensee, or upon any leasehold or other interest in such facility, and the rights of the creditors so secured may thereafter be enforced by any court subject to rules and regulations established by the Commission to protect public health and safety and promote the common defense and security.

Construction permits. 42 U.S.C. sec. 2235.

"SEC. 185. CONSTRUCTION PERMITS. — All applicants for licenses to construct or modify production or utilization facilities shall, if the application is otherwise acceptable to the Commission, be initially granted a construction permit. The construction permit shall state the earliest and latest dates for the completion of the construction or modification. Unless the construction or modification of the facility is completed by the completion date, the construction permit shall expire, and all rights thereunder be forfeited, unless upon good cause shown, the Commission extends the completion

date. Upon the completion of the construction or modification of the facility, upon the filing of any additional information needed to bring the original application up to date, and upon finding that the facility authorized has been constructed and will operate in conformity with the application as amended and in conformity with the provisions of this Act and of the rules and regulations of the Commission, and in the absence of any good cause being shown to the Commission why the granting of a license would not be in accordance with the provisions of this Act, the Commission shall thereupon issue a license to the applicant. For all other purposes of this Act, a construction permit is deemed to be a 'license'.

"SEC. 186. REVOCATION. —

Revocation. 42 U.S.C. sec. 2236.

"a. Any license may be revoked for any material false statement in the application or any statement of fact required under section 182, or because of conditions revealed by such application or statement of fact or any report, record, or inspection or other means which would warrant the Commission to refuse to grant a license on an original application, or for failure to construct or operate a facility in accordance with the terms of the construction permit or license or the technical specifications in the application, or for violation of, or failure to observe any of the terms and provisions of this Act or of any regulation of the Commission.

"b. The Commission shall follow the provisions of section 9(b) of the Administrative Procedure Act in revoking any license.

80 Stat. 388, 5 U.S.C. 558(b).

"c. Upon revocation of the license, the Commission may immediately retake possession of all special nuclear material held by the licensee. In cases found by the Commission to be of extreme importance to the national defense and security or to the health and safety of the public, the Commission may recapture any special nuclear material held by the licensee or may enter upon and operate the facility prior to any of the procedures provided under the Administrative Procedure Act. Just compensation shall be paid for the use of the facility.

5 U.S.C. 551.

Modification of license. 42 U.S.C. sec. 2237.

"SEC. 187. MODIFICATION OF LICENSE. — The terms and conditions of all licenses shall be subject to amendment, revision, or modification, by reason of amendments of this Act, or by reason of rules and regulations issued in accordance with the terms of this Act.

Continued operation of facilities. 42 U.S.C. sec. 2238.

"SEC. 188. CONTINUED OPERATION OF FACILITIES. — Whenever the Commission finds that the public convenience and necessity or the production program of the Commission requires continued operation of a production facility or utilization facility the license for which has been revoked pursuant to section 186, the Commission may, after consultation with the appropriate regulatory agency, State or Federal, having jurisdiction, order that possession be taken of and such facility be operated for such period of time as the public convenience and necessity or the production program of the Commission may, in the judgment of the Commission, require, or until a license for the operation of the facility

shall become effective. Just compensation shall be paid for the use of the facility.

Hearings and judicial review. 42 U.S.C. sec. 2239.

"SEC. 189. HEARINGS AND JUDICIAL REVIEW. —

"a. In any proceeding under this Act, for the granting, suspending, revoking, or amending of any license or construction permit, or application to transfer control, and in any proceeding for the issuance or modification of rules and regulations dealing with the activities of licensees, and in any proceeding for the payment of compensation, an award, or royalties under sections 153, 157, 186 c., or 188, the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding. The Commission shall hold a hearing after thirty days' notice and publication once in the Federal Register, on each application under section 103 or 104 b. for a construction permit for a facility, and on any application under section 104 c. for a construction permit for a testing facility. In cases where such a construction permit has been issued following the holding of such a hearing, the Commission may, in the absence of a request therefor by any person whose interest may be affected, issue an operating license or an amendment to a construction permit or an amendment to an operating license without a hearing, but upon thirty days' notice and publication once in the Federal Register of its intent to do so. The Commission may dispense with such thirty days' notice and publication with respect to any application for an amendment to a construction per-

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mit or an amendment to an operating license upon a determination by the Commission that the amendment involves no significant hazards consideration.

"b. Any final order entered in any proceeding of the kind specified in subsection a. above shall be subject to judicial review in the manner prescribed in the Act of December 29, 1950, as amended (ch. 1189, 64 Stat. 1129), and to the provisions of section 10 of the Administrative Procedure Act, as amended.

5 U.S.C. 701-706, 28 U.S.C. 2341-2352.

42 U.S.C. sec. 2240.

"SEC. 190. LICENSEE INCIDENT REPORTS. — No report by any licensee of any incident arising out of or in connection with a licensed activity made pursuant to any requirement of the Commission shall be admitted as evidence in any suit or action for damages growing out of any matter mentioned in such report.

Atomic Safety and Licensing Board. 80 Stat. 386, 387, 5 U.S.C. 556, 557. 42 U.S.C. sec. 2241.

"SEC. 191. ATOMIC SAFETY AND LICENSING BOARD. —

"a. Notwithstanding the provisions of sections 7(a) and 8(a) of the Administrative Procedure Act, the Commission is authorized to establish one or more atomic safety and licensing boards, each comprised of three members, one of whom shall be qualified in the conduct of administrative proceedings and two of whom shall have such technical or other qualifications as the Commission deems appropriate to the issues to be decided, to conduct such hearings as the Commission may direct and make such intermediate or final decisions as the Commission may au-

thorize with respect to the granting, suspending, revoking or amending of any license or authorization under the provisions of this Act, any other provision of law, or any regulation of the Commission issued thereunder. The Commission may delegate to a board such other regulatory functions as the Commission deems appropriate. The Commission may appoint a panel of qualified persons from which board members may be selected.

"b. Board members may be appointed by the Commission from private life, or designated from the staff of the Commission or other Federal agency. Board members appointed from private life shall receive a per diem compensation for each day spent in meetings or conferences, and all members shall receive their necessary traveling or other expenses while engaged in the work of a board. The provisions of section 163 shall be applicable to board members appointed from private life.

"SEC. 192. TEMPORARY OPERATING LICENSE. —

Temporary licensing authority. 42 U.S.C. sec. 2242.

"a. In any proceeding upon an application for an operating license for a nuclear power reactor, in which a hearing is otherwise required pursuant to section 189 a., the applicant may petition the Commission for a temporary operating license authorizing operation of the facility pending final action by the Commission on the application. Such petition may be filed at any time after filing of: (1) the report of the Advisory Committee on Reactor Safeguards required by subsection 182 b.; (2) the safety

evaluation of the application by the Commission's regulatory staff; and (3) the regulatory staff's final detailed statement on the environmental impact of the facility prepared pursuant to section 102(2) (C) of the National Environmental Policy Act of 1969 (83 Stat. 853) or, in the case of an application for operating license filed on or before September 9, 1971, if the regulatory staff's final detailed statement required under section 102(2) (C) is not completed, the Commission must satisfy the applicable requirements of the National Environmental Policy Act prior to issuing any temporary operating license under this section 192. The petition shall be accompanied by an affidavit or affidavits setting forth the facts upon which the petitioner relies to justify issuance of the temporary operating license. Any party to the proceeding may file affidavits in support of, or opposition to, the petition within fourteen days after the filing of such petition, or within such additional time not to exceed ten days as may be fixed by the Commission. The Commission shall hold a hearing after ten days' notice and publication once in the Federal Register on any such petition and supporting material filed under this section and the decision of the Commission with respect to the issuance of a temporary operating license following such hearing, shall be on the basis of findings on the matters specified in subsection b. of this section. The hearing required by this section and the decision of the Commission on the petition shall be conducted with expedited procedures as the Commission

may by rule, regulation, or order deem appropriate for a full disclosure of material facts on all substantial issues raised in connection with the proposed temporary operating license.

"b. With respect to any petition filed pursuant to subsection a. of this section, the Commission shall issue a temporary operating license upon finding that:

"(1) the provisions of section 185 have been met with respect to the temporary operating license;

"(2) operation of the facility during the period of the temporary operating license in accordance with its terms and conditions will provide adequate protection of the environment during the period of the temporary operating license; and

"(3) operation of the facility in accordance with the terms and conditions of the temporary operating license is essential toward insuring that the power generating capacity of a utility system or power pool is at, or is restored to, the levels required to assure the adequacy and reliability of the power supply, taking into consideration factors which include, but need not be limited to, alternative available sources of supply, historical reserve requirements for the systems involved to function reliably, the possible endangerment to the public health and safety in the event of power shortages, and data from appropriate Federal and State governmental bodies which have official responsibility to assure an adequate and reliable power supply.

The temporary license shall contain such terms and conditions as the Commission may deem necessary, including the duration of the license and any provision for the extension thereof, and the requirement that the licensee not retire or dismantle any of its existing generating capacity on the ground of the availability of the capacity from the facility which is operating under the temporary license. Any decision or other document authorizing the issuance of any temporary license pursuant to this section shall recite with specificity the reasons justifying the issuance. The decision of the Commission with respect to the issuance of a temporary operating license shall be subject to judicial review pursuant to the Act of December 29, 1950, as amended (ch. 1189, 64 Stat. 1129).

"c. The hearing on the application for the final operating license otherwise required pursuant to section 189 a. shall be concluded as promptly as practicable. The Commission shall vacate the temporary operating license if it finds that the applicant is not prosecuting the application for the final operating license with due diligence. Issuance of a temporary operating license pursuant to subsection b. of this section shall be without prejudice to the position of any party to the proceeding in which a hearing is otherwise required pursuant to section 189 a.: and failure to assert any ground for denial or limitation of a temporary operating license shall not bar the assertion of such ground in connection with the issuance of a subsequent final operating license.

"d. The authority under this section shall expire on October 30, 1973.

"CHAPTER 17. JOINT COMMITTEE ON ATOMIC ENERGY

Membership. 42 U.S.C. sec. 2251.

"SEC. 201. MEMBERSHIP. — There is hereby established a Joint Committee on Atomic Energy to be composed of nine Members of the Senate to be appointed by the President of the Senate, and nine Members of the House of Representatives to be appointed by the Speaker of the House of Representatives. In each instance not more than five Members shall be members of the same political party.

Authority and duty. 42 U.S.C. sec. 2252.

"SEC. 202. AUTHORITY AND DUTY. —

Joint Committee on Atomic Energy hearings.

"a. The Joint Committee shall make continuing studies of the activities of the Atomic Energy Commission and of problems relating to the development, use, and control of atomic energy. During the first ninety days of each session of the Congress, the Joint Committee may conduct hearings in either open or executive session for the purpose of receiving information concerning the development, growth, and state of the atomic energy industry. The Commission shall keep the Joint Committee fully and currently informed with respect to all of the Commission's activities. The Department of Defense shall keep the Joint Committee fully and currently informed with respect to all matters within the Department of Defense relating to the development, utilization, or application of atomic energy. Any Government agency shall

furnish any information requested by the Joint Committee with respect to the activities or responsibilities of that agency in the field of atomic energy. All bills, resolutions, and other matters in the Senate or the House of Representatives relating primarily to the Commission or to the development, use, or control of atomic energy shall be referred to the Joint Committee. The members of the Joint Committee who are Members of the Senate shall from time to time report to the Senate, and the members of the Joint Committee who are Members of the House of Representatives shall from time to time report to the House, by bill or otherwise, their recommendations with respect to matters within the jurisdiction of their respective Houses which are referred to the Joint Committee or otherwise within the jurisdiction of the Joint Committee.

"b. The members of the Joint Committee who are Members of the Senate and the members of the Joint Committee who are Members of the House of Representatives shall, on or before June 30 of each year, report to their respective Houses on the development, use, and control of nuclear energy for the common defenses and security and for peaceful purposes. Each report shall provide facts and information available to the Joint Committee concerning nuclear energy which will assist the appropriate committees of the Congress and individual members in the exercise of informed judgment on matters of weaponry; foreign policy; defense; international trade; and in respect to the expenditure and

appropriation of Government revenues. Each report shall be presented formally under circumstances which provide for clarification and discussion by the Senate and the House of Representatives. In recognition of the need for public understanding, presentations of the reports shall be made to the maximum extent possible in open session and by means of unclassified written materials.

"SEC. 203. CHAIRMAN. — Vacancies in the membership of the Joint Committee shall not affect the power of the remaining members to execute the functions of the Joint Committee, and shall be filled in the same manner as in the case of the original selection. The Joint Committee shall select a Chairman and a Vice Chairman from among its members at the beginning of each Congress. The Vice Chairman shall act in the place and stead of the Chairman in the absence of the Chairman. The Chairmanship shall alternate between the Senate and the House of Representatives with each Congress, and the Chairman shall be selected by the Members from that House entitled to the Chairmanship. The Vice Chairman shall be chosen from the House other than that of the Chairman by the Members from that House.

Chairman.
42 U.S.C. sec. 2253.

"SEC. 204. POWERS. — In carrying out its duties under this Act, the Joint Committee, or any duly authorized subcommittee thereof, is authorized to hold such hearings or investigations, to sit and act at such places and times, to require, by subpena or otherwise, the attend-

Powers.
42 U.S.C. sec. 2254.

ance of such witnesses and the production of such books, papers, and documents, to administer such oaths, to take such testimony, to procure such printing and binding, and to make such expenditures as it deems advisable. The Joint Committee may make such rules respecting its organization and procedures as it deems necessary: *Provided, however,* That no measure or recommendation shall be reported from the Joint Committee unless a majority of the committee assent. Subpenas may be issued over the signature of the Chairman of the Joint Committee or by any member designated by him or by the Joint Committee, and may be served by such person or persons as may be designated by such Chairman or member. The Chairman of the Joint Committee or any member thereof may administer oaths to witnesses.

Committee seal. 2 U.S.C. 192-194.

The Joint Committee may use a committee seal. The provisions of sections 102 to 104, inclusive, of the Revised Statutes, as amended, shall apply in case of any failure of any witness to comply with a subpena or to testify when summoned under authority of this section. The expenses of the Joint Committee shall be paid from the contingent fund of the Senate from funds appropriated for the Joint Committee upon vouchers approved by the Chairman. The cost of stenographic service to report public hearings shall not be in excess of the amounts prescribed by law for reporting the hearings of standing committees of the Senate. The cost of stenographic service to report executive hearings shall be fixed at an equitable rate by the

Joint Committee. Members of the Joint Committee, and its employees and consultants, while traveling on official business for the Joint Committee, may receive either the per diem allowance authorized to be paid to Members of Congress or its employees, or their actual and necessary expenses provided an itemized statement of such expenses is attached to the voucher.

Staff and assistance. 42 U.S.C. sec. 2255.

"SEC. 205. STAFF AND ASSISTANCE. — The Joint Committee is empowered to appoint and fix the compensation of such experts, consultants, technicians, and staff employees as it deems necessary and advisable. The Joint Committee is authorized to utilize the services, information, facilities, and personnel of the departments and establishments of the Government. The Joint Committee is authorized to permit such of its members, employees, and consultants as it deems necessary in the interest of common defense and security to carry firearms while in the discharge of their official duties for the committee.

Classification of information. 42 U.S.C. sec. 2256.

"SEC. 206. CLASSIFICATION OF INFORMATION. — The Joint Committee may classify information originating within the committee in accordance with standards used generally by the executive branch for classifying Restricted Data or defense information.

Records. 42 U.S.C. sec. 2257.

"SEC. 207. RECORDS. — The Joint Committee shall keep a complete record of all committee actions, including a record of the votes on any

question on which a record vote is demanded. All committee records, data, charts and files shall be the property of the Joint Committee and shall be kept in the offices of the Joint Committee or other places as the Joint Committee may direct under such security safeguards as the Joint Committee shall determine in the interest of the common defense and security.

"CHAPTER 19. MISCELLANEOUS

Report to Congress. 42 U.S.C. sec. 2016.

"SEC. 251. REPORT TO CONGRESS. — The Commission shall submit to the Congress, in January of each year, a report concerning the activities of the Commission. The Commission shall include in such report, and shall at such other times as it deems desirable submit to the Congress, such recommendations for additional legislation as the Commission deems necessary or desirable.

Energy Reorganization Act of 1974

AN ACT

To reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration and in a new Nuclear Regulatory Commission in order to promote more efficient management of such functions.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

Energy Reorganization Act of 1974.

SECTION 1. This Act may be cited as the "Energy Reorganization Act of 1974". 42 U.S.C. 5801 note.

DECLARATION OF PURPOSE

SEC. 2. (a) The Congress hereby declares that the general welfare and the common defense and security require effective action to develop, and increase the efficiency and reliability of use of, all energy sources to meet the needs of present and future generations, to increase the productivity of the national economy and strengthen its position in regard to international trade, to make the Nation self-sufficient in energy, to advance the goals of restoring, protecting, and enhancing environmental quality, and to assure public health and safety. 42 U.S.C. 5801.

Energy Research and Development Administration, establishment.

(b) The Congress finds that, to best achieve these objectives, improve Government operations, and assure the coordinated and effective development of all energy sources, it is necessary to establish an Energy Research and Development Administration to bring together and direct Federal activities relating to research and development on the various sources of energy, to increase the efficiency and reliability in the use of energy, and to carry out the performance of other functions, including but not limited to the Atomic Energy Commission's military and production activities and its general basic research activities. In establishing an Energy Research and Development Administration to achieve these objectives, the Congress intends that all possible sources of energy be developed consistent with warranted priorities.

88 Stat. 1233.
88 Stat. 1234.

Separation of AEC licensing and regulatory functions.

(c) The Congress finds that it is in the public interest that the licensing and related regulatory functions of the Atomic Energy Commission be separated from the performance of the other functions of the Commission, and that this separation be effected in an orderly manner, pursuant to this Act, assuring adequacy of technical and other resources necessary for the performance of each.

Small business participation.

(d) The Congress declares that it is in the public interest and the policy of Congress that small business concerns be given a reasonable opportunity to participate, insofar as is possible, fairly and equitably in grants, contracts, purchases, and other Federal activities relating

to research, development, and demonstration of sources of energy efficiency, and utilization and conservation of energy. In carrying out this policy, to the extent practicable, the Administrator shall consult with the Administrator of the Small Business Administration.

Priorities.

(e) Determination of priorities which are warranted should be based on such considerations as power-related values of an energy source, preservation of material resources, reduction of pollutants, export market potential (including reduction of imports), among others. On such a basis, energy sources warranting priority might include, but not be limited to, the various methods of utilizing solar energy.

TITLE I — ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

ESTABLISHMENT

42 U.S.C. 5811.

SEC. 101. There is hereby established an independent executive agency to be known as the Energy Research and Development Administration (hereinafter in this Act referred to as the "Administration").

OFFICERS

Administrator.
42 U.S.C. 5812.

SEC. 102. (a) There shall be at the head of the Administration an Administrator of Energy Research and Development (hereinafter in this Act referred to as the "Administrator"), who shall be appointed from civilian life by the President by and with the advice and consent

of the Senate. A person may not be appointed as Administrator within two years after release from active duty as a commissioned officer of a regular component of an Armed Force. The Administration shall be administered under the supervision and direction of the Administrator, who shall be responsible for the efficient and coordinated management of the Administration.

Deputy Administrator.

(b) There shall be in the Administration a Deputy Administrator, who shall be appointed by the President, by and with the advice and consent of the Senate.

88 Stat. 1234. 88 Stat. 1235.

(c) The President shall appoint the Administrator and Deputy Administrator from among individuals who, by reason of their general background and experience are specially qualified to manage a full range of energy research and development programs.

Assistant Administrators.

(d) There shall be in the Administration six Assistant Administrators, one of whom shall be responsible for fossil energy, another for nuclear energy, another for environment and safety, another for conservation, another for solar, geothermal, and advanced energy systems, and another for national security. The Assistant Administrators shall be appointed by the President, by and with the advice and consent of the Senate. The President shall appoint each Assistant Administrator from among individuals who, by reason of general background and experience, are specially qualified to manage the energy technology area assigned to such Assistant Administrator.

General Counsel.

(e) There shall be in the Administration a General Counsel who shall be appointed by the Administrator and who shall serve at the pleasure of and be removable by the Administrator.

Additional officers.

(f) There shall be in the Administration not more than eight additional officers appointed by the Administrator. The positions of such officers shall be considered career positions and be subject to subsection 161 d. of the Atomic Energy Act.

Director of Military Application.

(g) The Division of Military Application transferred to and established in the Administration by section 104 (d) of this Act shall be under the direction of a Director of Military Application, who shall be appointed by the Administrator and who shall serve at the pleasure of and be removable by the Administrator and shall be an active commissioned officer of the Armed Forces serving in general or flag officer rank or grade. The functions, qualifications, and compensation of the Director of Military Application shall be the same as those provided under the Atomic Energy Act of 1954, as amended, for the Assistant General Manager for Military Application.

42 U.S.C. 2011 note.

International cooperation.

(h) Officers appointed pursuant to this section shall perform such functions as the Administrator shall specify from time to time. The Administrator shall delegate to one such officer the special responsibility for international cooperation in all energy and related environmental research and development.

Order of succession.

(i) The Deputy Administrator (or in the absence or disability of the Deputy Administra-

tor, or in the event of a vacancy in the office of the Deputy Administrator, an Assistant Administrator, the General Counsel or such other official, determined according to such order as the Administrator shall prescribe) shall act for and perform the functions of the Administrator during any absence or disability of the Administrator or in the event of a vacancy in the office of the Administrator.

RESPONSIBILITIES OF THE ADMINISTRATOR

42 U.S.C. 5813.

SEC. 103. The responsibilities of the Administrator shall include, but not be limited to —

88 Stat. 1235.
88 Stat. 1236.

(1) exercising central responsibility for policy planning, coordination, support, and management of research and development programs respecting all energy sources, including assessing the requirements for research and development in regard to various energy sources in relation to near-term and long-range needs, policy planning in regard to meeting those requirements, undertaking programs for the optimal development of the various forms of energy sources, managing such programs, and disseminating information resulting therefrom:

(2) encouraging and conducting research and development, including demonstration of commercial feasibility and practical applications of the extraction, conversion, storage, transmission, and utilization phases related to the development and use of energy from fossil, nuclear, solar, geothermal, and other energy sources;

(3) engaging in and supporting environmental, biomedical, physical, and safety research related to the development of energy sources and utilization technologies;

(4) taking into account the existence, progress, and results of other public and private research and development activities, including those activities of the Federal Energy Administration relating to the development of energy resources using currently available technology in promoting increased utilization of energy resources, relevant to the Administration's mission in formulating its own research and development programs;

(5) participating in and supporting cooperative research and development projects which may involve contributions by public or private persons or agencies, of financial or other resources to the performance of the work;

(6) developing, collecting, distributing, and making available for distribution, scientific and technical information concerning the manufacture or development of energy and its efficient extraction, conversion, transmission, and utilization;

(7) creating and encouraging the development of general information to the public on all energy conservation technologies and energy sources as they become available for general use, and the Administrator, in conjunction with the Administrator of the Federal Energy Administration shall, to the extent practicable, disseminate such information through the use of mass communications;

(8) encouraging and conducting research and development in energy conservation, which shall be directed toward the goals of reducing total energy consumption to the maximum extent practicable, and toward maximum possible improvement in the efficiency of energy use. Development of new and improved conservation measures shall be conducted with the goal of the most expeditious possible application of these measures;

(9) encouraging and participating in international cooperation in energy and related environmental research and development;

88 Stat. 1236.
88 Stat. 1237.

(10) helping to assure an adequate supply of manpower for the accomplishment of energy research and development programs, by sponsoring and assisting in education and training activities in institutions of higher education, vocational schools, and other institutions, and by assuring the collection, analysis, and dissemination of necessary manpower supply and demand data;

(11) encouraging and conducting research and development in clean and renewable energy sources.

ABOLITION AND TRANSFERS

Atomic Energy Commission.
42 U.S.C. 5814.

SEC. 104. (a) The Atomic Energy Commission is hereby abolished. Sections 21 and 22 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2031 and 2032) are repealed.

(b) All other functions of the Commission, the Chairman and members of the Commission,

and the officers and components of the Commission are hereby transferred or allowed to lapse pursuant to the provisions of this Act.

(c) There are hereby transferred to and vested in the Administrator all functions of the Atomic Energy Commission, the Chairman and members of the Commission, and the officers and components of the Commission, except as otherwise provided in this Act.

(d) The General Advisory Committee established pursuant to section 26 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2036), the Patent Compensation Board established pursuant to section 157 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2187) and the Divisions of Military Application and Naval Research established pursuant to section 25 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2035), are transferred to the Energy Research and Development Administration and the functions of the Commission with respect thereto, and with respect to relations with the Military Liaison Committee established by section 27 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2037), are transferred to the Administrator.

Interior Department functions.

(e) There are hereby transferred to and vested in the Administrator such functions of the Secretary of the Interior, the Department of the Interior, and officers and components of such department —

(1) as relate to or are utilized by the Office of Cost Research established pursuant to the

Act of June 1, 1960 (74 Stat. 336; 30 U.S.C. 661-668);

(2) as relate to or are utilized in connection with fossil fuel energy research and development programs and related activities conducted by the Bureau of Mines "energy centers" and synthane plant to provide greater efficiency in the extraction, processing and utilization of energy resources for the purpose of conserving those resources, developing alternative energy resources such as oil and gas secondary and tertiary recovery, oil, shale and synthetic fuels, in proving methods of managing energy-related waste and pollutants, and providing technical guidance needed to establish and administer national energy policies; and

(3) as relate to or are utilized for underground electric power transmission research.

88 Stat. 1238. Helium applications study.

The Administrator shall conduct a study of the potential energy applications of helium and, within six months from the date of the enactment of this Act, report to the President and Congress his recommendations concerning the management of the Federal helium programs, as they relate to energy.

88 Stat. 1238. Report to President and Congress.

National Science Foundation functions.

(f) There are hereby transferred to and vested in the Administrator such functions of the National Science Foundation as relate to or are utilized in connection with —

(1) solar heating and cooling development; and

(2) geothermal power development.

Environmental Protection Agency functions.

(g) There are hereby transferred to and vested in the Administrator such functions of the Environmental Protection Agency and the officers and components thereof as relate to or are utilized in connection with research, development, and demonstration, but not assessment of monitoring for regulatory purposes, of alternative automotive power systems.

(h) To the extent necessary or appropriate to perform functions and carry out programs transferred by this Act, the Administrator and Commissions may exercise, in relation to the functions so transferred, any authority or part thereof available by law, including appropriation Acts, to the official or agency from which such functions were transferred.

Use of other agencies' capabilities.

(i) In the exercise of his responsibilities under section 103, the Administrator shall utilize, with their consent, to the fullest extent he determines advisable the technical and management capabilities of other executive agencies having facilities, personnel, or other resources which can assist or advantageously be expanded to assist in carrying out such responsibilities. The Administrator shall consult with the head of each agency with respect to such facilities, personnel, or other resources, and may assign, with their consent, specific programs or projects in energy research and development as appropriate. In making such assignments under this subsection, the head of each such agency shall insure that —

(1) such assignments shall be in addition to and not detract from the basic mission responsibilities of the agency, and

(2) such assignments shall be carried out under such guidance as the Administrator deems appropriate.

ADMINISTRATIVE PROVISIONS

Regulations. 42 U.S.C. 5815.

SEC. 105. (a) The Administrator is authorized to prescribe such policies, standards, criteria, procedures, rules, and regulations as he may deem to be necessary or appropriate to perform functions now or hereafter vested in him.

Policy planning and evaluation.

(b) The Administrator shall engage in such policy planning, and perform such program evaluation analyses and other studies, as may be necessary to promote the efficient and coordinated administration of the Administration and properly assess progress toward the achievement of its missions.

Delegation of functions.

(c) Except as otherwise expressly provided by law, the Administrator may delegate any of his functions to such officers and employees of the Administration as he may designate, and may authorize such successive redelegations of such functions as he may deem to be necessary or appropriate.

Organization.

(d) Except as provided in section 102 and in section 104(d), the Administrator may organize the Administration as he may deem to be necessary or appropriate.

Field offices.

(e) The Administrator is authorized to establish, maintain, alter, or discontinue such State, regional, district, local, or other field offices as he may deem to be necessary or appropriate to perform functions now or hereafter vested in him.

88 Stat. 1239. Seal.

(f) The Administrator shall cause a seal of office to be made for the Administration of such device as he shall approve, and judicial notice shall be taken of such seal.

Working capital fund.

(g) The Administrator is authorized to establish a working capital fund, to be available without fiscal year limitation, for expenses necessary for the maintenance and operation of such common administrative services he shall find to be desirable in the interests of economy and efficiency. There shall be transferred to the fund the stocks of supplies, equipment, assets other than real property, liabilities, and unpaid obligations relating to the services which he determines will be performed through the fund. Appropriations to the fund, in such amounts as may be necessary to provide additional working capital are authorized. The working capital fund shall recover from the appropriations and funds for which services are performed, either in advance or by way of reimbursement, amounts which will approximate the costs incurred including the accrual of annual leave and the depreciation of equipment. The fund shall also be credited with receipts from the sale or exchange of its property, and receipts in payment for loss or damage to property owned by the fund.

Information from other agencies.

(h) Each department, agency, and instrumentality of the executive branch of the Government is authorized to furnish to the Administrator, upon his request, any information or other data which the Administrator deems necessary to carry out his duties under this title.

PERSONNEL AND SERVICES

Appointment and pay.
42 U.S.C. 5816.

SEC. 106. (a) The Administrator is authorized to select, appoint, employ, and fix the compensation of such officers and employees, including attorneys, pursuant to section 161 d. of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2201(d)) as are necessary to perform the functions now or hereafter vested in him and to prescribe their functions.

Experts and consultants.

(b) The Administrator is authorized to obtain services as provided by section 3109 of title 5 of the United States Code.

Military personnel.

(c) The Administrator is authorized to provide for participation of military personnel in the performance of his functions. Members of the Army, the Navy, the Air Force, or the Marine Corps may be detailed for service in the Administration by the appropriate military Secretary, pursuant to cooperative agreements with the Secretary, for service in the Administration in positions other than a position the occupant of which must be approved by and with the advice and consent of the Senate.

(d) Appointment, detail, or assignment to, acceptance of, and service in, any appointive or other position in the Administration under this

section shall in no way alter the status, office, rank, or grade which such officers or enlisted men may occupy or hold, or any emolument, prerequisite, right, privilege, or benefit incident to or arising out of any such status, office, rank, or grade. A member so appointed, detailed, or assigned shall not be subject to direction or control by his Armed Force, or any officer thereof, directly or indirectly, with respect to the responsibilities exercised in the position to which appointed, detailed, or assigned.

Transportation and per diem.

(e) The Administrator is authorized to pay transportation expenses, and per diem in lieu of subsistence expenses, in accordance with chapter 57 of title 5 of the United States Code for travel between places of recruitment and duty, and while at places of duty, of persons appointed for emergency, temporary, or seasonal services in the field service of the Administration.

88 Stat. 1240. Personnel of other agencies.

(f) The Administrator is authorized to utilize, on a reimbursable basis, the services of any personnel made available by any department, agency, or instrumentality, including any independent agency of the Government.

Advisory boards.
5 U.S.C. app. I.

(g) The Administrator is authorized to establish advisory boards, in accordance with the provisions of the Federal Advisory Committee Act (Public Law 92-463), to advise with and make recommendations to the Administrator on legislation, policies, administration, research, and other matters.

Noncitizens.

(h) The Administrator is authorized to employ persons who are not citizens of the United

States in expert, scientific, technical, or professional capacities whenever he deems it in the public interest.

POWERS

Research and development.

42 U.S.C. 5817

SEC. 107. (a) The Administrator is authorized to exercise his powers in such manner as to insure the continued conduct of research and development and related activities in areas or fields deemed by the Administrator to be pertinent to the acquisition of an expanded fund of scientific, technical, and practical knowledge in energy matters. To this end, the Administrator is authorized to make arrangements (including contracts, agreements, and loans) for the conduct of research and development activities with private or public institutions or persons, including participation in joint or cooperative projects of a research, developmental, or experimental nature; to make payments (in lump sum or installments, and in advance or by way of reimbursement, with necessary adjustments on account of overpayments or underpayments); and generally to take such steps as he may deem necessary or appropriate to perform functions now or hereafter vested in him. Such functions of the Administrator under this Act as are applicable to the nuclear activities transferred pursuant to this title shall be subject to the provisions of the Atomic Energy Act of 1954, as amended, and to other authority applicable to such nuclear activities. The non-nuclear responsibilities and functions of the Administrator referred to in sections 103 and 104 of this

Contracts, etc.

42 U.S.C. 2011 note.

Act shall be carried out pursuant to the provisions of this Act, applicable authority existing immediately before the effective date of this Act, or in accordance with the provisions of chapter 4 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2051-2053).

Facilities and real property.
40 U.S.C. 601 note.
5 U.S.C. app. II.

(b) Except for public buildings as defined in the Public Buildings Act of 1959, as amended, and with respect to leased space subject to the provisions of Reorganization Plan Numbered 18 of 1950, the Administrator is authorized to acquire (by purchase, lease, condemnation, or otherwise), construct, improve, repair, operate, and maintain facilities and real property as the Administrator deems to be necessary in and outside of the District of Columbia. Such authority shall apply only to facilities required for the maintenance and operation of laboratories, research and testing sites and facilities, quarters, and related accommodations for employees and dependents of employees of the Administration, and such other special-purpose real property as the Administrator deems to be necessary in and outside the District of Columbia. Title to any property or interest therein, real, personal, or mixed, acquired pursuant to this section, shall be in the United States.

Services for employees at remote locations.

(c)(1) The Administrator is authorized to provide, construct, or maintain, as necessary and when not otherwise available, the following for employees and their dependents stationed at remote locations:

(A) Emergency medical services and supplies.

(B) Food and other subsistence supplies.

88 Stat. 1241.

(C) Messing facilities.

(D) Audiovisual equipment, accessories, and supplies for recreation and training.

(E) Reimbursement for food, clothing, medicine, and other supplies furnished by such employees in emergencies for the temporary relief of distressed persons.

(F) Living and working quarters and facilities.

(G) Transportation for school-age dependents of employees to the nearest appropriate educational facilities.

(2) The furnishing of medical treatment under sub-paragraph (A) of paragraph (1) and the furnishing of services and supplies under paragraphs (B) and (C) of paragraph (1) shall be at prices reflecting reasonable value as determined by the Administrator.

(3) Proceeds from reimbursements under this section shall be deposited in the Treasury and may be withdrawn by the Administrator to pay directly the cost of such work or services, to repay or make advances to appropriations or funds which do or will bear all or a part of such cost, or to refund excess sums when necessary; except that such payments may be credited to a service or working capital fund otherwise established by law, and used under the law governing such funds, if the fund is available for use by the Administrator for performing the work or services for which payment is received.

Acquisition of copyrights, patents, etc.

(d) The Administrator is authorized to acquire any of the following described rights if the property acquired thereby is for use in, or is

useful to, the performance of functions vested in him:

(1) Copyrights, patents, and applications for patents, designs, processes, specifications, and data.

(2) Licenses under copyrights, patents, and applications for patents.

(3) Releases, before suit is brought, for past infringement of patents or copyrights.

Dissemination of information.

(e) Subject to the provisions of chapter 12 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2161-2166), and other applicable law, the Administrator shall disseminate scientific, technical, and practical information acquired pursuant to this title through information programs and other appropriate means, and shall encourage the dissemination of scientific, technical, and practical information relating to energy so as to enlarge the fund of such information and to provide that free interchange of ideas and criticism which is essential to scientific and industrial progress and public understanding.

Gifts and bequests.

(f) The Administrator is authorized to accept, hold, administer, and utilize gifts, and bequests of property, both real and personal, for the purpose of aiding or facilitating the work of the Administration. Gifts and bequests of money and proceeds from sales of other property received as gifts or bequests shall be deposited in the Treasury and shall be disbursed upon the order of the Administrator. For the purposes of Federal income, estate, and gift taxes, property accepted under this section shall be considered as a gift or bequest to the United States.

INTERIM COORDINATION

Energy Resources Council, establishment. 42 U.S.C. 5818.

SEC. 108. (a) There is established in the Executive Office of the President an Energy Resources Council. The Council shall be composed of the Secretary of the Interior, the Administrator of the Federal Energy Administration, the Administrator of the Energy Research and Development Administration, the Secretary of State, the Director, Office of Management and Budget, and such other officials of the Federal Government as the President may designate. The President shall designate one of the members of the Council to serve as Chairman.

88 Stat. 1242.

(b) It shall be the duty and function of the Council to —

(1) insure communication and coordination among the agencies of the Federal Government which have responsibilities for the development and implementation of energy policy or for the management of energy resources:

(2) make recommendations to the President and to the Congress for measures to improve the implementation of Federal energy policies or the management of energy resources with particular emphasis upon policies and activities involving two or more Departments or independent agencies; and

(3) advise the President in the preparation of the reorganization recommendations required by section 110 of this Act.

Testimony before Congress.

(c) The Chairman of the Council may not refuse to testify before the Congress or any duly

authorized committee thereof regarding the duties of the Council or other matters concerning interagency coordination of energy policy and activities.

Effective date. Publication in Federal Register.

(d) This section shall be effective no later than sixty days after the enactment of this Act or such earlier date as the President shall prescribe and publish in the Federal Register, and shall terminate upon enactment of a permanent department responsible for energy and natural resources or two years after such effective date, whichever shall occur first.

FUTURE REORGANIZATION

Report to Congress. 42 U.S.C. 5819.

SEC. 109. (a) The President shall transmit to the Congress as promptly as possible, but not later than June 30, 1975, such additional recommendations as he deems advisable for organization of energy and related functions in the Federal Government, including, but not limited to, whether or not there shall be established (1) a Department of Energy and Natural Resources, (2) an Energy Policy Council, and (3) a consolidation in whole or in part of regulatory functions concerning energy.

(b) This report shall replace and serve the purposes of the report required by section 15(a) (4) of the Federal Energy Administration Act. *Ante*, p. 109.

COORDINATION WITH ENVIRONMENTAL EFFORTS

42 U.S.C. 5820.

SEC. 110. The Administrator is authorized to establish programs to utilize research and development performed by other Federal agen-

cies to minimize the adverse environmental effects of energy projects. The Administrator of the Environmental Protection Agency, as well as other affected agencies and departments, shall cooperate fully with the Administrator in establishing and maintaining such programs, and in establishing appropriate inter-agency agreements to develop cooperative programs and to avoid unnecessary duplication.

TITLE II — NUCLEAR REGULATORY COMMISSION

ESTABLISHMENT AND TRANSFERS

Members and Chairman. 42 U.S.C. 5841.

SEC. 201. (a) There is established an independent regulatory commission to be known as the Nuclear Regulatory Commission which shall be composed of five members, each of whom shall be a citizen of the United States. The

88 Stat. 1243.

President shall designate one member of the Commission as Chairman thereof to serve as such during the pleasure of the President. The Chairman may from time to time designate any other member of the Commission as Acting Chairman to act in the place and stead of the Chairman during his absence. The Chairman (or the Acting Chairman in the absence of the Chairman) shall preside at all meetings of the Commission and a quorum for the transaction of business shall consist of at least three members present. Each member of the Commission, including the Chairman, shall have equal responsibility and authority in all decisions and actions of the Commission, shall have full access to all information relating to the performance of his duties or responsibilities, and shall have one vote. Action of the Commission shall be determined by a majority vote of the members present. The Chairman (or Acting Chairman in the absence of the Chairman) shall be the official spokesman of the Commission in its relations with the Congress, Government agencies, persons, or the public, and, on behalf of the Commission, shall see to the faithful execution of the policies and decisions of the Commission, and shall report thereon to the Commission from time to time or as the Commission may direct. The Commission shall have an official seal which shall be judicially noticed.

Seal.

(b)(1) Members of the Commission shall be appointed by the President, by and with the advice and consent of the Senate.

(2) Appointments of members pursuant to this sub-section shall be made in such a manner that not more than three members of the Commission shall be members of the same political party.

(c) Each member shall serve for a term of five years, each such term to commence on July 1, except that of the five members first appointed to the Commission, one shall serve for one year, one for two years, one for three years, one for four years, and one for five years, to be designated by the President at the time of appointment.

(d) Such initial appointments shall be submitted to the Senate within sixty days of the

Submission of appointments to Senate.

signing of this Act. Any individual who is serving as a member of the Atomic Energy Commission at the time of the enactment of this Act, and who may be appointed by the President to the Commission, shall be appointed for a term designated by the President, but which term shall terminate not later than the end of his present term as a member of the Atomic Energy Commission, without regard to the requirements of subsection (b)(2) of this section. Any subsequent appointment of such individuals shall be subject to the provisions of this section.

(e) Any member of the Commission may be removed by the President for inefficiency, neglect of duty, or malfeasance in office. No member of the Commission shall engage in any business, vocation, or employment other than that of serving as a member of the Commission.

Transfer of AEC functions and personnel.

(f) There are hereby transferred to the Commission all the licensing and related regulatory functions of the Atomic Energy Commission, the Chairman and members of the Commission, the General Counsel, and other officers and components of the Commission — which functions, officers, components, and personnel are excepted from the transfer to the Administrator by section 104(c) of this Act.

Additional transfers.

(g) In addition to other functions and personnel transferred to the Commission, there are also transferred to the Commission —

(1) the functions of the Atomic Safety and Licensing Board Panel and the Atomic Safety and Licensing Appeal Board;

(2) such personnel as the Director of the Office of Management and Budget determines are necessary for exercising responsibilities under section 205, relating to, research, for the purpose of confirmatory assessment relating to licensing and other regulation under the provisions of the Atomic Energy Act of 1954, as amended, and of this Act. 88 Stat. 1244.

42 U.S.C. 2011 note.

LICENSING AND RELATED REGULATORY FUNCTIONS RESPECTING SELECTED ADMINISTRATION FACILITIES

SEC. 202. Notwithstanding the exclusions provided for in section 110 a. or any other provisions of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2140(a)), the Nuclear Regulatory Commission shall, except as otherwise specifically provided by section 110 b. of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2140(b)), or other law, have licensing and related regulatory authority pursuant to chapters 6, 7, 8, and 10 of the Atomic Energy Act of 1954, as amended, as to the following facilities of the Administration: 42 U.S.C. 5842. 42 U.S.C. 2071-2112, 2131-2140.

(1) Demonstration Liquid Metal Fast Breeder reactors when operated as part of the power generation facilities of an electric utility system, or when operated in any other manner for the purpose of demonstrating the suitability for commercial application of such a reactor.

(2) Other demonstration nuclear reactors — except those in existence on the effective date of this Act — when operated as part of the power generation facilities of an electric utility system, or when operated in any other manner for

the purpose of demonstrating the suitability for commercial application of such a reactor.

(3) Facilities used primarily for the receipt and storage of high-level radioactive wastes resulting from activities licensed under such Act.

(4) Retrievable Surface Storage Facilities and other facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the Administration, which are not used for, or are part of, research and development activities.

OFFICE OF NUCLEAR REACTOR REGULATION

Establishment. 42 U.S.C. 5843. Director.

SEC. 203. (a) There is hereby established in the Commission an Office of Nuclear Reactor Regulation under the direction of a Director of Nuclear Reactor Regulation, who shall be appointed by the Commission, who may report directly to the Commission, as provided in section 209, and who shall serve at the pleasure of and be removable by the Commission.

Functions.

(b) Subject to the provisions of this Act, the Director of Nuclear Reactor Regulation shall perform such functions as the Commission shall delegate including:

(1) Principal licensing and regulation involving all facilities, and materials licensed under the Atomic Energy Act of 1954, as amended, associated with the construction and operation of nuclear reactors licensed under the Atomic Energy Act of 1954, as amended;

42 U.S.C. 2011 note.

(2) Review the safety and safeguards of all such facilities, materials, and activities, and

such review functions shall include, but not be limited to—

(A) monitoring, testing and recommending upgrading of systems designed to prevent substantial health or safety hazards; and

88 Stat. 1245.

(B) evaluating methods of transporting special nuclear and other nuclear materials and of transporting and storing high-level radioactive wastes to prevent radiation hazards to employees and the general public.

(3) Recommend research necessary for the discharge of the functions of the Commission.

(c) Nothing in this section shall be construed to limit in any way the functions of the Administration relating to the safe operation of all facilities resulting from all activities within the jurisdiction of the Administration pursuant to this Act.

OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

SEC. 204. (a) There is hereby established in the Commission an Office of Nuclear Material Safety and Safeguards under the direction of a Director of Nuclear Material Safety and Safeguards, who shall be appointed by the Commission, who may report directly to the Commission as provided in section 209, and who shall serve at the pleasure of and be removable by the Commission.

Establishment. 42 U.S.C. 5844. Director.

(b) Subject to the provisions of this Act, the Director of Nuclear Material Safety and Safeguards shall perform such functions as the Commission shall delegate, including:

Functions.

42 U.S.C. 2011 note.

(1) Principal licensing and regulation involving all facilities and materials, licensed under the Atomic Energy Act of 1954, as amended, associated with the processing, transport, and handling of nuclear materials, including the provision and maintenance of safeguards against threats, thefts, and sabotage of such licensed facilities, and materials.

(2) Review safety and safeguards of all such facilities and materials licensed under the Atomic Energy Act of 1954, as amended, and such review shall include, but not be limited to—

(A) monitoring, testing, and recommending upgrading of internal accounting systems for special nuclear and other nuclear materials licensed under the Atomic Energy Act of 1954, as amended;

(B) developing, in consultation and coordination with the Administration, contingency plans for dealing with threats, thefts, and sabotage relating to special nuclear materials, high-level radioactive wastes and nuclear facilities resulting from all activities licensed under the Atomic Energy Act of 1954, as amended;

(C) assessing the need for, and the feasibility of, establishing a security agency within the office for the performance of the safeguards functions, and a report with recommendations on this matter shall be prepared within one year of the effective date of this Act and promptly transmitted to the Congress by the Commission.

Report to Congress.

(3) Recommending research to enable the Commission to more effectively perform its functions.

(c) Nothing in this section shall be construed to limit in any way the functions of the Administration relating to the safeguarding of special nuclear materials, high-level radioactive wastes and nuclear facilities resulting from all activities within the jurisdiction of the Administration pursuant to this Act.

88 Stat. 1246.

OFFICE OF NUCLEAR REGULATORY RESEARCH

SEC. 205. (a) There is hereby established in the Commission and Office of Nuclear Regulatory Research under the direction of a Director of Nuclear Regulatory Research, who shall be appointed by the Commission, who may report directly to the Commission as provided in section 209, and who shall serve at the pleasure of and be removable by the Commission.

Establishment. 42 U.S.C. 5845.

Director.

(b) Subject to the provisions of this Act, the Director of Nuclear Regulatory Research shall perform such functions as the Commission shall delegate including:

Functions.

(1) Developing recommendations for research deemed necessary for performance by the Commission of its licensing and related regulatory functions.

(2) Engaging in or contracting for research which the Commission deems necessary for the performance of its licensing and related regulatory functions.

(c) The Administrator of the Administration and the head of every other Federal agency shall —

Cooperation of Federal agencies.

(1) cooperate with respect to the establishment of priorities for the furnishing of such research services as requested by the Commission for the conduct of its functions;

(2) furnish to the Commission, on a reimbursable basis, through their own facilities or by contract or other arrangement, such research services as the Commission deems necessary and requests for the performance of its functions; and

(3) consult and cooperate with the Commission on research and development matters of mutual interest and provide such information and physical access to its facilities as will assist the Commission in acquiring the expertise necessary to perform its licensing and related regulatory functions.

(d) Nothing in subsections (a) and (b) of this section or section 201 of this Act shall be construed to limit in any way the functions of the Administration relating to the safety of activities within the jurisdiction of the Administration.

Information and research services.

(e) Each Federal agency, subject to the provisions of existing law, shall cooperate with the Commission and provide such information and research services, on a reimbursable basis, as it may have or be reasonably able to acquire.

NONCOMPLIANCE

42 U.S.C. 5846.

SEC. 206. (a) Any individual director, or responsible officer of a firm constructing, owning, operating, or supplying the components of any

42 U.S.C. 2011 note.

facility or activity which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954 as amended, or pursuant to this Act, who obtains information reasonably indicating that such facility or activity or basic components supplied to such facility or activity —

(1) fails to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order, or license of the Commission relating to substantial safety hazards, or

(2) contains a defect which would create a substantial safety hazard, as defined by regulations which the Commission shall promulgate,

shall immediately notify the Commission of such failure to comply, or of such defect, unless such person has actual knowledge that the Commission has been adequately informed of such defect or failure to comply.

88 Stat. 1247.

Penalty.

(b) Any person who knowingly and consciously fails to provide the notice required by subsection (a) of this section shall be subject to a civil penalty in an amount equal to the amount provided by section 234 of the Atomic Energy Act of 1954, as amended.

42 U.S.C. 2282.

Posting of requirements.

42 U.S.C. 2011 note.

(c) The requirements of this section shall be prominently posted on the premises of any facility licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended.

Enforcement.

(d) The Commission is authorized to conduct such reasonable inspections and other enforcement activities as needed to insure compliance with the provisions of this section.

NUCLEAR ENERGY CENTER SITE SURVEY

42 U.S.C. 5847.

SEC. 207. (a)(1) The Commission is authorized and directed to make or cause to be made under its direction, a national survey, which shall include consideration of each of the existing or future electric reliability regions, or other appropriate regional areas, to locate and identify possible nuclear energy center sites. This survey shall be conducted in cooperation with other interested Federal, State, and local agencies, and the views of interested persons, including electric utilities, citizens' groups, and others, shall be solicited and considered.

Federal-State-local cooperation. Solicitation of views.

Definition.

(2) For purposes of this section, the term "nuclear energy center site" means any site, including a site not restricted to land, large enough to support utility operations or other elements of the total nuclear fuel cycle, or both including, if appropriate, nuclear fuel reprocessing facilities, nuclear fuel fabrication plants, retrievable nuclear waste storage facilities, and uranium enrichment facilities.

(3) The survey shall include —

(a) a regional evaluation of natural resources, including land, air, and water resources, available for use in connection with nuclear energy center sites; estimates of future electric power requirements that can be served by each nuclear energy center site; an assessment of the economic impact of each nuclear energy site; and consideration of any other relevant factors, including but not limited to population distribution, proximity to electric load centers and to other elements of the fuel cycle, transmission

line rights-of-way, and the availability of other fuel resources;

(b) an evaluation of the environmental impact likely to result from construction and operation of such nuclear energy centers, including an evaluation whether such nuclear energy centers will result in greater or lesser environmental impact than separate siting of the reactors and/or fuel cycle facilities; and

(c) consideration of the use of federally owned property and other property designated for public use, but excluding national parks, national forests, national wilderness areas, and national historic monuments.

Report to Congress and Council on Environmental Quality; public availability.

(4) A report of the results of the survey shall be published and transmitted to the Congress and the Council on Environmental Quality not later than one year from the date of the enactment of this Act and shall be made available to the public, and shall be updated from time to time thereafter as the Commission, in its discretion, deems advisable. The report shall include the Commission's evaluation of the results of the survey and any conclusions and recommendations, including recommendations for legislation, which the Commission may have concerning the feasibility and practicality of locating nuclear power reactors and/or other elements of the nuclear fuel cycle or nuclear energy center sites. The Commission is authorized to adopt policies which will encourage the location of nuclear power reactors and related fuel cycle facilities on nuclear energy center sites insofar as practicable.

88 Stat. 1248.

ABNORMAL OCCURRENCE REPORTS

Reports to Congress. 42 U.S.C. 5848.

SEC. 208. The Commission shall submit to the Congress each quarter a report listing for that period any abnormal occurrences at or associated with any facility which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954 as amended, or pursuant to this Act. For the purposes of this section an abnormal occurrence is an unscheduled incident or event which the Commission determines is significant from the standpoint of public health or safety. Nothing in the preceding sentence shall limit the authority of a court to review the determination of the Commission. Each such report shall contain —

42 U.S.C. 2011 note.

(1) the date and place of each occurrence;

(2) the nature and probable consequence of each occurrence;

(3) the cause or causes of each; and

(4) any action taken to prevent reoccurrence;

Public dissemination of information.

the Commission shall also provide as wide dissemination to the public of the information specified in clauses (1) and (2) of this section as reasonably possible within fifteen days of its receiving information of each abnormal occurrence and shall provide as wide dissemination to the public as reasonably possible of the information specified in clauses (3) and (4) as soon as such information becomes available to it.

OTHER OFFICERS

Executive Director. 42 U.S.C. 5849.

SEC. 209. (a) The Commission shall appoint an Executive Director for Operations, who shall

serve at the pleasure of and be removable by the Commission.

Functions.

(b) The Executive Director shall perform such functions as the Commission may direct, except that the Executive Director shall not limit the authority of the director of any component organization provided in this Act to communicate with or report directly to the Commission when such director of a component organization deems it necessary to carry out his responsibilities.

Other officers.

(c) There shall be in the Commission not more than five additional officers appointed by the Commission. The positions of such officers shall be considered career positions and be subject to subsection 161 d. of the Atomic Energy Act.

42 U.S.C. 2201.

TITLE III — MISCELLANEOUS AND TRANSITIONAL PROVISIONS

TRANSITIONAL PROVISIONS

Lapses of agencies and positions. 42 U.S.C. 5871.

SEC. 301. (a) Except as otherwise provided in this Act, whenever all of the functions or programs of an agency, or other body, or any component thereof, affected by this Act, have been transferred from that agency, or other body, or any component thereof by this Act, the agency, or other body, or component thereof shall lapse. If an agency, or other body, or any component thereof, lapses pursuant to the preceding sentence, each position and office therein which was expressly authorized by law, or the incumbent

of which was authorized to receive compensation at the rate prescribed for an office or position at level II, III, IV, or V of the Executive Schedule (5 U.S.C. 5313-5316), shall lapse.

88 Stat. 1249.

Savings clauses.

(b) All orders, determinations, rules, regulations, permits, contracts, certificates, licenses, and privileges —

(1) which have been issued, made, granted, or allowed to become effective by the President, any Federal department or agency or official thereof, or by a court of competent jurisdiction, in the performance of functions which are transferred under this Act, and

(2) which are in effect at the time this Act takes effect,

shall continue in effect according to their terms until modified, terminated, superseded, set aside, or revoked by the President, the Administrator, the Commission, or other authorized officials, a court of competent jurisdiction, or by operation of law.

(c) The provisions of this Act shall not affect any proceeding pending, at the time this section takes effect, before the Atomic Energy Commission or any department or agency (or component thereof) functions of which are transferred by this Act; but such proceedings, to the extent that they relate to functions so transferred, shall be continued. Orders shall be issued in such proceedings, appeals shall be taken therefrom, and payments shall be made pursuant to such orders, as if this Act had not been enacted; and orders issued in any such proceedings shall continue in effect until modified, terminated, superseded, or revoked by a duly authorized official, by a court of competent jurisdiction, or by operation of law. Nothing in this subsection shall be deemed to prohibit the discontinuance or modification of any such proceeding under the same terms and conditions and to the same extent that such proceeding could have been discontinued if this Act had not been enacted.

(d) Except as provided in subsection (f) —

(1) the provisions of this Act shall not affect suits commenced prior to the date this Act takes effect, and

(2) in all such suits proceedings shall be had, appeals taken, and judgments rendered, in the same manner and effect as if this Act had not been enacted.

(e) No suit, action, or other proceeding commenced by or against any officer in his official capacity as an officer of any department or agency, functions of which are transferred by this Act, shall abate by reason of the enactment of this Act. No cause of action by or against any department or agency, functions of which are transferred by this Act, or by or against any officer thereof in his official capacity shall abate by reason of the enactment of this Act. Causes of actions, suits, actions, or other proceedings may be asserted by or against the United States or such official as may be appropriate and, in any litigation pending when this section takes effect, the court may at any time, on its own motion or that of any party, enter any order which will give effect to the provisions of this section.

(f) If, before the date on which this Act takes effect, any department or agency, or officer thereof in his official capacity, is a party to a suit, and under this Act any function of such department, agency, or officer is transferred to the Administrator or Commission, or any other official, then such suit shall be continued as if this Act had not been enacted, with the Administrator or Commission, or other official, as the case may be, substituted.

(g) Final orders and actions of any official or component in the performance of functions transferred by this Act shall be subject to judicial review to the same extent and in the same manner as if such orders or actions had been made or taken by the officer, department, agency, or instrumentality in the performance of such functions immediately preceding the effective date of the Act. Any statutory requirements relating to notices, hearings, action upon the record, or administrative review that apply to any function transferred by this Act shall apply to the performance of those functions by the Administrator or Commission, or any officer or component.

88 Stat. 1250.

(h) With respect to any function transferred by this Act and performed after the effective date of this Act, reference in any other law to any department or agency, or any officer or office, the functions of which are so transferred, shall be deemed to refer to the Administration, the Administrator or Commission, or other office or official in which this Act vests such functions.

(i) Nothing contained in this Act shall be construed to limit, curtail, abolish, or terminate

any function of the President which he had immediately before the effective date of this Act; or to limit, curtail, abolish, or terminate his authority to perform such function; or to limit, curtail, abolish, or terminate his authority to delegate, redelegate, or terminate any delegation of functions.

(j) Any reference in this Act to any provision of law shall be deemed to include, as appropriate, references thereto as now or hereafter amended or supplemented.

(k) Except as may be otherwise expressly provided in this Act, all functions expressly conferred by this Act shall be in addition to and not in substitution for functions existing immediately before the effective date of this Act and transferred by this Act.

TRANSFER OF PERSONNEL AND OTHER MATTERS

SEC. 302. (a) Except as provided in the next sentence, the personnel employed in connection with, and the personnel positions, assets, liabilities, contracts, property, records, and unexpended balances of appropriations, authorizations, allocations, and other funds employed, held, used, arising from, available to or to be made available in connection with the functions and programs transferred by this Act, are, subject to section 202 of the Budget and Accounting Procedures Act of 1950 (31 U.S.C. 581c), correspondingly transferred for appropriate allocation. Personnel positions expressly created by law, personnel occupying those positions on

42 U.S.C. 5872.

the effective date of this Act, and personnel authorized to receive compensation at the rate prescribed for offices and positions at levels II, III, IV, or V of the Executive Schedule (5 U.S.C. 5313-5316) on the effective date of this Act shall be subject to the provisions of subsection (c) of this section and section 301 of this Act.

(b) Except as provided in subsection (c), transfer of nontemporary personnel pursuant to this Act shall not cause any such employee to be separated or reduced in grade or compensation for one year after such transfer.

(c) Any person who, on the effective date of this Act, held a position compensated in accordance with the Executive Schedule prescribed in chapter 53 of title 5 of the United States Code, and who, without a break in service, is appointed in the Administration to a position having duties comparable to those performed immediately preceding his appointment shall continue to be compensated in his new position at not less than the rate provided for his previous position.

INCIDENTAL DISPOSITIONS

42 U.S.C. 5873.

SEC. 303. The Director of the Office of Management and Budget is authorized to make such additional incidental dispositions of personnel, personnel positions, assets, liabilities, contracts, property, records, and unexpended balances of appropriations, authorizations, allocations, and other funds held, used, arising from, available to or to be made available in connection with functions transferred by this Act, as he may

88 Stat. 1251.

deem necessary or appropriate to accomplish the intent and purpose of this Act.

DEFINITIONS

SEC. 304. As used in this Act— 42 U.S.C. 5874.

(1) any reference to "function" or "functions" shall be deemed to include references to duty, obligation, power, authority, responsibility, right, privilege, and activity, or the plural thereof, as the case may be; and

(2) any reference to "perform" or "performance", when used in relation to functions, shall be deemed to include the exercise of power, authority, rights, and privileges.

AUTHORIZATION OF APPROPRIATIONS

SEC. 305. (a) Except as otherwise provided by law, appropriations made under this Act shall be subject to annual authorization. 42 U.S.C. 5875.

(b) Authorization of appropriations to the Commission shall reflect the need for effective licensing and other regulation of the nuclear power industry in relation to the growth of such industry.

COMPTROLLER GENERAL AUDIT

SEC. 306. (a) Section 166. "Comptroller General Audit" of the Atomic Energy Act of 1954, as amended, shall be deemed to be applicable, respectively, to the nuclear and nonnuclear activities under title I and to the activities under title II. 42 U.S.C. 5876. 42 U.S.C. 2206.

Ante, pp. 1234, 1242.

(b) The Comptroller General of the United States shall audit, review, and evaluate the implementation of the provisions of title II of this Act by the Nuclear Safety and Licensing Commission not later than sixty months after the effective date of this Act, the Comptroller General shall prepare and submit to the Congress a report on his audit, which shall contain, but not be limited to —

Report to Congress.

(1) an evaluation of the effectiveness of the licensing and related regulatory activities of the Commission and the operations of the Office of Nuclear Safety Research and the Bureau of Nuclear Materials Security;

(2) an evaluation of the effect of such Commission activities on the efficiency, effectiveness, and safety with which the activities licensed under the Atomic Energy Act of 1954, as amended, are carried out;

(3) recommendations concerning any legislation he deems necessary, and the reasons therefor, for improving the implementation of title II.

REPORTS

Reports to the President and Congress. 42 U.S.C. 5877. Administration activities and progress.

SEC. 307. (a) The Administrator shall, as soon as practicable after the end of each fiscal year, make a report to the President for submission to the Congress on the activities of the Administration during the preceding fiscal year. Such report shall include a statement of the short-range and long-range goals, priorities, and plans of the Administration together with an assessment of the progress made toward the

attainment of those objectives and toward the more effective and efficient management of the Administration and the coordination of its functions.

Feasibility of transferring military application functions. 88 Stat. 1252.

(b) During the first year of operation of the Administration, the Administrator, in collaboration with the Secretary of Defense, shall conduct a thorough review of the desirability and feasibility of transferring to the Department of Defense or other Federal agencies the functions of the Administrator respecting military application and restricted data, and within one year after the Administrator first takes office the Administrator shall make a report to the President, for submission to the Congress, setting forth his comprehensive analysis, the principal alternatives, and the specific recommendations of the Administrator and the Secretary of Defense.

Commission activities and findings.

(c) The Commission shall, as soon as practicable after the end of each fiscal year, make a report to the President for submission to the Congress on the activities of the Commission during the preceding fiscal year. Such report shall include a clear statement of the short-range and long-range goals, priorities, and plans of the Commission as they relate to the benefits, costs, and risks of commercial nuclear power. Such report shall also include a clear description of the Commission's activities and findings in the following areas —

(1) insuring the safe design of nuclear power plants and other licensed facilities;

(2) investigating abnormal occurrences and defects in nuclear powerplants and other licensed facilities;

(3) safeguarding special nuclear materials at all stages of the nuclear fuel cycle;

(4) investigating suspected, attempted, or actual thefts of special nuclear materials in the licensed sector and developing contingency plans for dealing with such incidents;

(5) insuring the safe, permanent disposal of high-level radioactive wastes through the licensing of nuclear activities and facilities;

(6) protecting the public against the hazards of low-level radioactive emissions from licensed nuclear activities and facilities.

INFORMATION TO COMMITTEES

42 U.S.C. 5878. SEC. 308. The Administrator shall keep the appropriate congressional committees fully and currently informed with respect to all of the Administration's activities.

TRANSFER OF FUNDS

42 U.S.C. 5879. SEC. 309. The Administrator, when authorized in an appropriation Act, may, in any fiscal year, transfer funds from one appropriation to another within the Administration; except, that no appropriation shall be either increased or decreased pursuant to this section by more than 5 per centum of the appropriation for such fiscal year.

CONFORMING AMENDMENTS TO CERTAIN OTHER LAWS

SEC. 310. Subchapter II (relating to Executive Schedule pay rates) of chapter 53 of title 5, United States Code, is amended as follows:

(1) Section 5313 is amended by striking out "(8) Chairman, Atomic Energy Commission." and inserting in lieu thereof "(8) Chairman, Nuclear Regulatory Commission.", and by adding at the end thereof the following:

"(22) Administrator of Energy Research and Development Administration.".

(2) Section 5314 is amended by striking out "(42) Members, Atomic Energy Commission." and inserting in lieu thereof "(42) Members, Nuclear Regulatory Commission.", and by adding at the end thereof the following:

"(60) Deputy Administrator, Energy Research and Development Administration.".

(3) Section 5315 is amended by striking out paragraph (50), and by adding at the end thereof the following: 88 Stat. 1253.

"(100) Assistant Administrators, Energy Research and Development Administration (6).

"(101) Director of Nuclear Reactor Regulation, Nuclear Regulatory Commission.

"(102) Director of Nuclear Material Safety and Safeguards, Nuclear Regulatory Commission.

"(103) Director of Nuclear Regulatory Research, Nuclear Regulatory Commission.

"(104) Executive Director for Operations, Nuclear Regulatory Commission."

(4) Section 5316 is amended by striking out paragraphs (29), (62), (69), and (102), by striking out "(81) General Counsel of the Atomic Energy Commission," and inserting in lieu thereof "(81) General Counsel of the Nuclear

Regulatory Commission.", and by adding at the end thereof the following:

"(134) General Counsel, Energy Research and Development Administration.

"(135) Additional officers, Energy Research and Development Administration (8).

"(136) Additional officers, Nuclear Regulatory Commission (5).".

SEPARABILITY

42 U.S.C. 5801 note.

SEC. 311. If any provision of this Act, or the application thereof to any person or circumstance, is held invalid, the remainder of this Act, and the application of such provision to other persons or circumstances, shall not be affected thereby.

EFFECTIVE DATE AND INTERIM APPOINTMENTS

42 U.S.C. 5801 note. Publication in Federal Register.

SEC. 312. (a) This Act shall take effect one hundred and twenty days after the date of its enactment, or on such earlier date that the President may prescribe and publish in the Federal Register; except that any of the officers provided for in title I of this Act may be nominated and appointed, as provided by this Act, at any time after the date of enactment of this Act. Funds available to any department or agency (or any official or component thereof), any functions of which are transferred to the Administrator and the Commission by this Act, may, with the approval of the President, be used to pay the compensation and expenses of any officer appointed pursuant to this subsection until such time as funds for that purpose are otherwise available.

(b) In the event that any officer required by this Act to be appointed by and with the advice and consent of the Senate shall not have entered upon office on the effective date of this Act, the President may designate any officer, whose appointment was required to be made by and with the advice and consent of the Senate and who was such an officer immediately prior to the effective date of this Act, to act in such office until the office is filled as provided in this Act. While so acting, such persons shall receive compensation at the rates provided by this Act for the respective offices in which they act.

TITLE IV — SEX DISCRIMINATION

88 Stat. 1254.

SEX DISCRIMINATION PROHIBITED

42 U.S.C. 5891

SEC. 401. No person shall on the ground of sex be excluded from participation in, be denied a license under, be denied the benefits of, or be subjected to discrimination under any program or activity carried on or receiving Federal assistance under any title of this Act. This provision will be enforced through agency provisions and rules similar to those already established, with respect to racial and other discrimination, under title VI of the Civil Rights Act of 1964. 42 U.S.C. 2000d. However, this remedy is not exclusive and will not prejudice or cut off any other legal remedies available to a discriminatee.

Approved October 11, 1974.

LEGISLATIVE HISTORY

HOUSE REPORTS: No. 93-707 (Committee on Government Operations) and No. 93-1445 (Committee of Conference).

SENATE REPORT: No. 93-980 accompanying S. 2744 (Committee on Government Operations).

National Environmental Policy Act of 1969, § 102

SECTION 102. The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall —

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on —

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review processes;

(D) Any detailed statement required under subparagraph (C) after January 1, 1970, for any major Federal action funded under a program of grants to States shall not be deemed to be legally insufficient solely by reason of having been prepared by a State agency or official, if:

(i) the State agency or official has statewide jurisdiction and has the responsibility for such action,

(ii) the responsible Federal official furnishes guidance and participates in such preparation,

(iii) the responsible Federal official independently evaluates such statement prior to its approval and adoption, and

(iv) after January 1, 1976, the responsible Federal official provides early notification to, and solicits the views of, any other State or any Federal land management entity of any action or any alternative thereto

which may have significant impacts upon such State or Federal land management entity and, if there is any disagreement on such impacts, prepares a written assessment of such impacts and views for incorporation into such detailed statement.

The procedures in this subparagraph shall not relieve the Federal official of his responsibilities for the scope, objectivity, and content of the entire statement or of any other responsibility under this Act; and further, this subparagraph does not affect the legal sufficiency of statements prepared by State agencies with less than statewide jurisdiction.

(E) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(F) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(G) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(H) initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(I) assist the Council on Environmental Quality established by title II of this Act.

10 CFR § 51.20(e)

(e) In the Environmental Report required by paragraph (a) for light-water-cooled nuclear power reactors, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low level wastes and high level wastes related to uranium fuel cycle activities to the environmental costs of licensing the nuclear power reactor, shall be as set forth in the following table. No further discussion of such environmental effects shall be required.

TABLE S-3. — *Summary of environmental considerations for uranium fuel cycle*

[Normalised to model LWR annual fuel requirement]

Natural resource use	Total	Maximum effect per annual fuel requirement of model 1,000 MWe LWR
Land (acres):		
Temporarily committed	63	
Undisturbed area	45	
Disturbed area	18	Equivalent to 90 MWe coal-fired powerplant.
Permanently committed	4.6	
Overburden moved (millions of MT)	2.7	Equivalent to 90 MWe coal-fired powerplant.
Water (millions of gallons):		
Discharged to air	156	≈2 percent model 1,000 MWe LWR with cooling tower.
Discharged to water bodies	11,040	
Discharged to ground	123	
Total	11,319	<4 percent of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousands of MW-hour)	317	<5 percent of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT)	115	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	92	<0.2 percent of model 1,000 MWe energy output.
Effluents—chemical (MT):		
Gases (including entrainment):[1]		
SO_x	4,400	
NO_x[2]	1,177	Equivalent to emissions from 45 MWe coal-fired plant for a year.
Hydrocarbons	13.5	
CO	28.7	
Particulates	1,156	
Other gases:		
F-	.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards—below level that has effects on human health.
Liquids:		
SO_4=	10.3	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constitutents that require dilution and the flow of dilution water are: NH_3—600 cfs. NO_3—20 cfs. Fluoride—70 cfs.
NO_3-	26.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl-	8.6	
Na^+	16.9	
NH_3	11.5	
Fe	.4	
Tailings solutions (thousands of MT)	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—Radiological (curies):		
Gases (including entrainment):		
Rn-222	75	Principally from mills—maximum annual dose rate <4 percent of average natural background within 5 mi of mill. Results in 0.06 man-rem per annual fuel requirement.
Ra-226	.02	
Th-230	.02	
Uranium	.032	
Tritium (thousand)	16.7	Principally from fuel reprocessing plants—Whole body dose is 6 man-rem per annual fuel requirements for population within 50 mi radius. This is <0.007 percent of average natural background dose to this population. Release from Federal Waste Repository of 0.006 Ci/yr has been included in fission products and transuranics total.
Kr-85 (thousands)	350	
I-129	.0024	
I-131	.024	
Fission products and transuranics	1.01	
Liquids:		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production-concentration 5 percent of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Ru-106[3]	.15	From reprocessing plants—maximum concentration 4 percent of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (thousands)	2.5	
Solids (buried):		
Other than high level	601	All except 1 Ci comes from mills—included in tailings returned to ground—no significant effluent to the environment, 1 Ci from conversion and fuel fabrication is buried.
Effluents — Thermal (billions of British Thermal Units)	3,360	<7 percent of model 1,000 MWe LWR.
Transportation (man-rem): Exposure of workers and general public.	.334	

[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.2 percent from natural gas use and process.
[3] Cs-137 (0.075 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

Supreme Court, U. S.
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Nos. 76-419 and 76-528

IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION, *Petitioner,*

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*, *Respondents.*

No. 76-528

CONSUMERS POWER COMPANY, *Petitioner,*

v.

NELSON AESCHLIMAN, SAGINAW VALLEY NUCLEAR STUDY GROUP, *et al.*, *Respondents.*

On Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION, *Petitioner,*

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*, *Respondents.*

No. 76-528

CONSUMERS POWER COMPANY, *Petitioner,*

v.

NELSON AESCHLIMAN, SAGINAW VALLEY NUCLEAR STUDY GROUP, *et al.*, *Respondents.*

On Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

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BRIEF FOR PETITIONER CONSUMERS POWER COMPANY

OPINION BELOW

The opinion of the Court of Appeals in the *Consumers Power* proceeding is reported at 547 F.2d 622, and appears in the Joint Appendix at pages 89-

111.* The decision of the Court of Appeals in the *Vermont Yankee* proceeding, decided on the same day and in effect incorporated into the decision in the *Consumers Power* proceeding, and the separate statements of Judges Bazelon and Tamm appear in the Joint Appendix at pages 28-86. The Court of Appeals order of October 8, 1976, correcting that decision appears in the Joint Appendix at pp. 87-88, and the decision, as so corrected, is reported at 547 F.2d 633. The decisions of the Atomic Energy Commission (later the Nuclear Regulatory Commission) in the *Consumers Power* proceeding are as follows: the initial decision of the Atomic Safety and Licensing Board of the Atomic Energy Commission of December 14, 1972, which appears in the Joint Appendix at pages 184-222 and is reported at 5 A.E.C. 261; the first decision of the Atomic Safety and Licensing Appeal Board on February 20, 1973, denying a motion for a new hearing, which appears in the Joint Appendix at pages 223-240 and is reported at 6 A.E.C. 60; the second and third decisions of the Appeal Board relating to the merits of the case, on March 26 and May 18, 1973, which appear in the Joint Appendix at pages 241-321 and are reported at 6 A.E.C. 182 and 6 A.E.C. 331; the decision of the Commission on January 24, 1974, following the filing of the petition to review, which appears in the Joint Appendix at pages 324-345 and is reported at 7 A.E.C. 19; the decisions of February 5, February 20 and April 11, 1974, which appear in the Joint Appendix at pages 346-347, 348-349, 350-351, respectively, and are reported at 7 A.E.C. 147, 149 and 311.

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* References to the Appendix to this brief are designated "App. ——." References to the Joint Appendix are designated "Joint App. ——."

JURISDICTION

The opinion of the Court of Appeals in the *Consumers Power* proceeding, which constitutes its judgment, was entered on July 21, 1976. The petition for a writ of certiorari was granted and the proceeding consolidated with that in *Vermont Yankee,* on February 22, 1977. The jurisdiction of this Court rests on 28 U.S.C. § 1254(1).

STATUTE AND REGULATION INVOLVED

The Appendix contains the relevant statutory provisions of the Atomic Energy Act of 1954 (42 U.S.C. §§ 2011 *et seq.*), App. pp. A-2-A-20, of the Energy Reorganization Act of 1974 (42 U.S.C. §§ 5801 *et seq.*), App. pp. A-21-A-64, and of the National Environmental Policy Act (42 U.S.C. § 4332), App. pp. A-25-A-27.

QUESTION PRESENTED

Did remand by the court below to the Nuclear Regulatory Commission of its orders granting petitioner licenses to construct a nuclear generating plant seriously misconstrue the relevant statutes in a way which threatens to frustrate the nation's nuclear energy program, and constitute such an unwarranted intrusion by the court into the administrative process as to call for review and reversal by this Court?

STATEMENT

The *Consumers Power* proceeding in the court below involved two petitions to review final orders of the Atomic Energy Commission—now the Nuclear Regulatory Commission—authorizing the issuance to petitioner Consumers Power Company (Consumers)

of permits to construct two nuclear reactors to generate electricity and process steam on a 1200-acre tract in Midland County, Michigan. The two petitions were consolidated in the court below and heard and decided together. On the same day, the court below decided the *Vermont Yankee* proceeding, with which the *Consumers* proceeding is consolidated in this Court, and in effect incorporated the *Vermont Yankee* decision in its decision in the *Consumers* proceeding. The relevant facts in the *Consumers* proceeding are as follows:

Consumers' application for permits to construct the plant was filed with the Commission in January 1969, pursuant to Sections 103, 182, 185 and 189 of the Atomic Energy Act of 1954 (Act) (42 U.S.C. §§ 2133, 2232, 2235 and 2239). The proposed facility is designed for co-generation. Some 1,300 megawatts of electricity will be generated for Consumers' integrated electric system in Michigan, as well as substantial amounts of process steam for an adjacent Dow Chemical Company complex. As required by Section 185 of the Act and the Commission's regulations (10 C.F.R. § 50.34), the application included a Preliminary Safety Analysis Report.

The application, including the four-volume Safety Analysis Report, was reviewed by both the Commission staff and the Advisory Committee on Reactor Safeguards, a body that is required to review each application and to make a publicly available report to the Commission concerning safety. See §§ 29 and 182(b) of the Act (42 U.S.C. §§ 2039, 2232(b)). The staff, after nearly two years of study and having received answers to its numerous requests for further information, issued a favorable Safety Evaluation on November 12, 1970 (R. 2605). The Advisory Committee had a few months earlier, on June 18, 1970, reached the same conclusion (R. 2616), and it reaffirmed its decision on September 23, 1970 (R. 2618).

On October 29, 1970, an Atomic Safety and Licensing Board was designated pursuant to Section 191 of the Act (42 U.S.C. § 2241) to hold public hearings on whether the construction permits should be granted. Hearings on radiological health and safety matters began on June 21, 1971, and lasted for 17 days. The petitioners below, Aeschliman, *et al.*, and Saginaw Valley, *et al.* (referred to hereinafter as "intervenors") were granted permission to intervene. On the final day of these hearings, the decision in *Calvert Cliffs' Coordinating Committee, Inc.* v. *Atomic Energy Commission,* 449 F.2d 1109 (D.C. Cir. 1971) invalidated the Commission's then regulations under the National Environmental Policy Act (NEPA). Accordingly, the Commission revised its regulations (10 C.F.R. Part 50, App. D, now Part 51), and undertook a further extensive environmental review of the proposed Midland licensing action. A Draft Environmental Statement was issued in January 1972 and, after comments on it had been received from government agencies and the public, a Final Environmental Statement was issued in March 1972. The statement concluded that the construction permits should be issued, subject to Consumers taking certain steps to protect the environment. During May and June 1972, 14 days of further hearings before the Licensing Board were held on environmental matters. On December 14, 1972 the Licensing Board, in a lengthy decision dealing with both the safety and the environmental issues, concluded that the construction permits should be issued, subject to certain conditions

to protect the environment. Joint App. pp. 184-222. That decision became immediately effective, notwithstanding further review (10 C.F.R. § 2.764), and construction has therefore been proceeding for more than four years, at a cost to date exceeding $450 million.[1]

Any party may take an appeal from the initial decision of the Licensing Board by filing exceptions, which are then reviewed for the Commission by an Atomic Safety and Licensing Appeal Board. 10 C.F.R. §§ 2.762, 2.765. The intervenors duly filed exceptions and, upon review, the Appeal Board, in a series of decisions, essentially affirmed the decision of the Licensing Board, subject to certain conditions relating to quality assurance. The first opinion (Joint App. pp. 223-240) rejected a motion for intervenor Saginaw for a new hearing on the ground of bias of the members of the Licensing Board. Its second opinion (Joint App. pp. 241-253)related to issues of quality assurance and quality control. Its final opinion (Joint App. pp. 254-321) dealt with all other aspects of the decision of the Licensing Board. The Commission did not review or amend the action of the Appeal Board embodied

[1] The regulatory scheme contemplates that construction will commence immediately following the licensing board's favorable decision notwithstanding the fact that, as in this proceeding, the decision may be subject to further administrative and judicial review. The regulations (10 C.F.R. § 2.764) provide that the initial decision of the licensing board "shall be effective immediately upon issuance . . ." subject to further review within the Commission and that the construction permit shall be issued within ten days after the issuance of the initial decision. While undertaking construction where the authorization may later be revoked or significantly modified creates substantial risks for the utility, the controlling economic, legal and other related aspects of the situation in which the utility finds itself ordinarily compel it to proceed.

in these three decisions, and they became the final decision of the Commission. 10 C.F.R. §§ 2.760, 2.786.

On July 16 and August 9, 1973, intervenors filed separate petitions for review in the court below, which subsequently consolidated the two proceedings. (Joint App. pp. 13, 19, 21.) While the cases were pending, intervenor Saginaw filed a motion with the Commission to "clarify" the decision of the Appeal Board and to reopen the proceedings in the light of the Commission's then recent decision on the treatment of energy conservation issues in *Niagara Mohawk Power Corp.*, 6 A.E.C. 995 (1973). On January 24, 1974, the Commission issued, and there was filed with the court below, a Memorandum and Order dealing at length with that issue, and denying the motion to reopen the proceeding. Joint App. pp. 324-345. On January 23, 1974, intervenor Saginaw filed another petition to reopen the proceedings to reassess the cost-benefit analysis because of increases in projected construction costs since the hearing. The Commission denied the petition (Joint App. pp. 346-347) and likewise denied a subsequent supplement to the petition in the nature of a petition for rehearing. Joint App. pp. 348-349.

The court below deferred its decision in this case until the issuance of its decision in the *Vermont Yankee* proceeding (Joint App. pp. 28-86), also decided on July 21, 1976. After having had the petitions for review under advisement for some 20 months, it remanded the Midland proceeding to the Commission for further proceedings. While rejecting some of the intervenors' objections, the court sustained the argument by intervenor Saginaw that the Environmental Impact Statement was fatally defective

for failure adequately to examine energy conservation as an alternative. Intervenor's comments on the draft Environmental Impact Statement, the court held, raised a "colorable alternative" of energy conservation which made it "incumbent on the Commission to undertake its own preliminary investigation of the proffered alternative sufficient to reach a rational judgment whether it is worthy of detailed consideration" and to "explain the basis for each conclusion" (Joint App. pp. 100-101), which, it concluded, the Commission had not done.

The court also sustained the argument of intervenor Saginaw that the report of the Advisory Committee on Reactor Safeguards (ACRS), which had reviewed the sophisticated engineering and safety problems involved in Consumers' application and made specific recommendations concerning some of them, was inadequate in that it stated, without further specification, "Other problems relating to large water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports." That, the court held, did not comply with the statutory mandate that the Committee's reports be made public. Joint App. pp. 104-106.

Finally, the court incorporated by reference its contemporaneous decision in the *Vermont Yankee* proceedings (Joint App. p. 109), in which it concluded that the Commission had been "capricious and arbitrary" in its consideration of waste disposal and reprocessing issues in its rulemaking proceeding on those issues. Joint App. p. 71. The Commission was directed to undertake "appropriate consideration" of such issues and to "restrike the cost-benefit analysis." Joint App. p. 109. Motions by Consumers and the Government to stay the mandate pending

application to this Court for a writ of certiorari were denied on September 2, 1976.

ADMINISTRATIVE PROCEEDINGS FOLLOWING THE DECISION BELOW

Shortly after the decisions of the court were announced, the Commission responded with a General Policy Statement (41 Fed. Reg. 34,707, Aug. 16, 1976, App. pp. A-28-A-36) stating that, subject to further judicial review and notwithstanding "significant impacts on the availability and costs of nuclear power facilities" (App. p. A-31), there would be a moratorium on the issuance of licenses for either construction or operation of nuclear power plants at least until a possible interim fuel cycle rule could be issued (App. p. A-31). The Statement likewise announced that the hearings before the Commission in the *Vermont Yankee* and *Consumers* cases should be reopened to determine whether the licenses already issued (for construction, in the present case, and for operation, in the *Vermont Yankee* case) should be suspended or modified (App. p. A-34), and that the question of suspension or modification would also "arise on a request for a show cause order seeking the suspension or modification on fuel cycle grounds of any other nuclear power plant license." App. p. A-34.

On October 13, 1976, the Commissioner issued a notice of proposed rulemaking for an "interim" fuel cycle rule for use while proceedings for a "final" rule were going forward. 41 Fed. Reg. 45,849, Oct. 18, 1976, App. pp. A-37-A-51. The proposed interim rule incorporated slightly revised values, based on a new study, for the waste management and fuel reprocessing portions of the nuclear fuel cycle.

Thereafter, on November 5, 1976, the Commission modified its previous position on suspensions. In a Supplemental General Statement (41 Fed. Reg. 49,898, Nov. 11, 1976), the Commission announced that it would not initiate further show cause proceedings against holders of construction or operating licenses, that it would suspend the show cause proceedings previously initiated pending the anticipated adoption of an interim rule, and that it would resume licensing in individual cases where use of the proposed interim rule would not tilt the cost-benefit balance against the issuance of the license. App. p. A-55.

On March 7, 1977, on the basis of the notice and written comments, the Commission adopted a "final interim" rule, embodying revised values for waste disposal and reprocessing, to be effective until September 14, 1978, *i.e.,* for approximately eighteen months. 42 Fed. Reg. 13,803, March 14, 1977, App. pp. A-57-A-77.[2] The notice states that values contained in the interim rule as adopted are not substantially different from the values as proposed; in addition, the values in the rule as adopted are not sufficiently different from those invalidated by the court below as "to warrant revocation or suspension on cost-benefit grounds." App. p. 70. Accordingly, the notice stated that show cause proceedings initiated pursuant to the General Statement of Policy and suspended pursuant to the Supplemental General Statement of Policy "will be terminated." App. p. 70.

[2] The notice states that some of the comments received in response to its October 13, 1976 notice of proposed rulemaking and invitation for such comments raised "the question whether an interim rule, without the benefit of oral hearings, is an appropriate mechanism . . ." in the circumstances. App. p. A-68. With emphasis on the interim character of the rule, the notice sets forth a legal justification for not conducting oral hearings. App. pp. A.68-A.71. 42 Fed. Reg., *supra* at 13,805-13,806.

However, on April 1, 1977, the Commission issued an order directing that the Appeal Board involved in each of the ten show cause proceedings which had been initiated (other than *Consumers Power*) to determine the impact of the interim rule on the cost-benefit balance which had been struck for each of the facilities involved. CLI-77-10, 5 NRC ——. On April 21, 1977 the Appeal Boards, acting jointly, issued a memorandum and order in those ten proceedings, and also in three other proceedings in which judgment on uranium fuel cycle matters had been reserved pending the promulgation of the interim rule, inviting submissions within thirty days from the parties in each proceeding assigning reasons why, in the light of the interim rule, the cost-benefit balance for the facility "tips, or might tip, in favor of the abandonment of the facility." ALAB-392, NRCI-7714, 5 NRC ——. (Slip Op., p. 13). As of the date of this brief, no decisions with respect of any of these proceedings have been reached. Further, on May 13, 1977, a petition to review the decision of the Commission adopting the "final interim" rule was filed in the court below." *NRDC* v. *NRC,* No. 77-1448.

The post decision proceedings involving *Consumers Power* have followed a somewhat different course. At the same time the Commission issued its General Statement of Policy it also issued a separate memorandum and order in the *Consumers Power* proceeding, reconvening a licensing board to determine whether the construction permits for Midland "should

be continued, modified or suspended until an interim fuel cycle has been made effective." CLI-76-11, NRCI-76/8, 65 (August 16, 1976). When the mandate was issued on September 3, 1976, the Commission treated that action as a direction from the court "to proceed with all remanded issues promptly and without awaiting Supreme Court disposition." CLI-76/9, 163, 164, September 14, 1976. Accordingly, it did not suspend the Consumers show cause proceeding when it suspended the other show cause proceedings.[3] Rather, hearings were directed to go forward both with respect to the initial suspension or modification issue, and with respect to the substance of the "remanded" issues.[4] After the grant of certiorari, Consumer's request to defer those hearings was denied.[5] The hearings on whether the construction permits should be continued, modified or suspended pending the outcome of the remanded issues have, as of the date of this brief, consumed 30 hearing days. No decision has issued. No schedule has yet been set for hearings on the remanded "substantive" issues.

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[3] On October 8, 1976, the court below did grant a stay of mandate in the Vermont Yankee proceeding "on condition that the United States Nuclear Regulatory Commission shall make any licenses granted between July 21, 1976 and the time when the mandate is issued subject to the outcome of the proceedings herein." Jt. App. p. 12.

[4] When show cause proceedings based solely on fuel cycle grounds were suspended, the Commission directed the Licensing Board to defer consideration of that issue in the Consumers Power proceeding. CLI-76-19, NRCI-76/11, 474 (November 5, 1976). However, after the interim rule was adopted, the issue was revived, but the Licensing Board, rather than the Appeal Board, was directed to consider the issue. ALAB-396, NRCI-77/5 (May 4, 1977).

[5] ALAB-395 NRCI-77/4—(April 29, 1977). The Commission had delegated the function of acting on the request to the Appeal Board.

SUMMARY OF ARGUMENT

I

The Congress, by the Atomic Energy Act of 1954, established a policy of encouraging the development and utilization of atomic energy for peaceful purposes, including the generation of electricity. At the same time, the Congress, recognizing the hazards, mandated the most careful consideration of such projects, as is apparent from the record in the present case. Safety and health considerations were examined in an elaborate safety analysis submitted with Consumers' application, which was reviewed both by the staff of the Commission and by an independent Advisory Committee, all subject to scrutiny by way of public hearings. Environmental issues were examined in an elaborate report by Consumers, followed by a draft environmental statement by the staff and, when comments on the draft had been solicited and considered, by a final environmental statement, again, all subjected to scrutiny by way of further public hearings. Moreover, the lengthy and detailed findings and conclusions of the Licensing Board, before which the hearings were held, were reviewed and approved by an Appeal Board, also in a lengthy and detailed set of opinions. And finally, the Commission itself, on a motion by intervenors to reopen the hearings, dealt extensively with the issues relating to energy conservation.

Decisions so reached should not be lightly set aside, particularly where, as here, the court below appears to have disagreed with judgments the Commission was authorized to make, and to have reached out for issues justifying a remand for further extensive proceedings. This should not be sanctioned by this Court.

II

A. The first such issue, as to which the court below found the Commission to have been "capricious and arbitrary," related to its treatment of "energy conservation" as an alternative under NEPA, §§ 102(C)(iii) and 102(D). On the contrary, the need for the power to be generated by the proposed plant was elaborately established. Intervenor's contentions, later characterized as relating to energy conservation, were in part answered in the initial decision of the Licensing Board and later, in response to intervenor's motion for clarification, by an extensive and detailed opinion by the Commission itself. The court below was not warranted in criticizing the Commission's position that workable rules for developing an adequate record on an energy conservation issue—"a novel and developing concept"—imposed responsibilities not only on the Commission but on the intervenors as well—"They must state clear and reasonably specific energy conservation contentions in a timely fashion." "Energy conservation," as the Commission pointed out, has a "deceptively simple ring" but in fact "suggests a virtually limitless merger of possible actions." In this proceeding, intervenors' contentions were fairly and adequately dealt with.

B. Moreover, the court below, in dealing with this issue, improperly construes NEPA as imposing strict procedural requirements on an agency in response to comments on a draft environmental impact statement. All that is required is that an agency deal with comments in a rational and responsible manner, as the Commission did here. Indeed, when the draft and final statements in this proceeding were proposed, the CEQ

guidelines did not even require draft statements; NEPA contains nothing about "energy conservation," and it was not until well after the NEPA hearings in this case had been concluded that the CEQ guidelines for the first time indicated that impact statements should consider "alternatives that will significantly conserve energy."

III

The second issue which the court below held required a remand relates to the alleged inadequacy of the report of the Advisory Committee on Reactor Safeguards, in that it cross-referenced its treatment of some issues to "previous ACRS reports." The issue is almost a contrived one, since intervenors' major argument below was that they had wrongfully been denied discovery by way of interrogatories and depositions addressed to individual members of the Advisory Board as to the basis for their safety conclusions. The "previous ACRS reports" were of course fully available in the Commission's Public Document Rooms. In any event, since the Advisory Committee report is not evidence, but indicates only that at an early stage an expert committee has had the opportunity to advise the Commission and its staff, it is judicial intervention run riot to declare, years after the event, that the Licensing Board made a fatal error requiring remand because it did not, *sua sponte,* send the report of the Advisory Board back to it for further explication.

IV

The "fuel cycle" issue—the third issue which the court below held required a remand—which was de-

cided in the *Vermont Yankee* proceeding and incorporated in the *Consumers* proceeding by reference, will be dealt with fully in the *Vermont Yankee* brief. We believe, however, that the Commission has dealt properly with the issue by dealing, at the hearings, with the environmental aspects involved in the transportation of fresh fuel to, and spent fuel from, Consumers' plant, transportation of packaged radioactive materials to low-level burying grounds, and the environmental effects associated with handling fuel at the site, and by dealing with generic rule-making with nuclear reprocessing and waste storage and disposal. Nor was the Commission "capricious and arbitrary" in its rule-making proceeding, even if it be assumed that environmental aspects of reprocessing and waste management are proper considerations in licensing nuclear power plants rather than proper for consideration in licensing reprocessing and waste management facilities themselves. The rule-making proceeding which the Commission conducted was conducted pursuant 5 U.S.C. §553—which is applicable to the Commission. It afforded full opportunity to participants to review the staff report on which the proposed rule was based, to make oral statements as well as written submissions, and full opportunity to present testimony. The holding of the court below that a more "sensitive" procedure was required cannot be reconciled with the decisions of this Court. Intervenors' sole request for additional documents was honored, and their general requests for opportunity to cross-examine were inadequate to require procedures exceeding the statutory requirements.

V

The final comment of the court below, that since the proceeding is to be remanded, the Commission is to reexamine the changed circumstances regarding the need for process steam and electric power from the proposed facility by The Dow Chemical Company, need not concern the Court in the event the Commission's order is otherwise valid. In fact, on an intervenor's motion, the Commission has already made one such reexamination. It is empowered to do so again, on motion or *sua sponte,* if the occasion demands.

ARGUMENT

I

By the Atomic Energy Act of 1954 Congress established a policy of encouraging the development and utilization of atomic energy for peaceful purposes, including the generation of electricity. By Section 1 of the Act:

> "It is declared to be the policy of the United States that—
>
> (a) the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare."

And by Section 3 of the Act, it is declared to be the "purpose" of Congress to provide:

> "(d) a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and with the health and safety of the public."

Among the "peaceful purposes" envisioned by Congress was, of course, the utilization of atomic energy for the generation of electricity. See S. Rep. No. 1699, 83d Cong., 2d Sess. p. 3 (1954); H. Rep. No. 2181, 83d Cong., 2d Sess., p. 3 (1954).

The Act also recognized that generation of energy by means of nuclear reactors presents serious potential hazards, as well as benefits. Responsive to that concern, the Act mandates the most careful consideration of any proposal to build and operate a nuclear reactor. Indeed, the Act, and the procedures of the (now) Nuclear Regulatory Commission implementing both the Act and the National Environmental Policy Act (NEPA) provide what must be the most elaborate, detailed and comprehensive administrative machinery ever devised for determining appropriate governmental action. It is into this process that the court below, misconstruing both the relevant statutes and the decisions of this Court, has improperly injected itself.

The Statement, *supra,* indicates the comprehensive nature of the procedures necessary under the statutes and regulations for even a construction permit. Before Consumers' application was even submitted to the Commission, the Act required (§ 185, 42 U.S.C. § 2235) the preparation of a Preliminary Safety Analysis Report—in the present case, this Report was over 2,000 pages in length (R. 1-2261). Then, when the application was submitted, regulations promulgated by the Commission (10 C.F.R. §§ 2.101, 2.102) required that the Report be reviewed by the Commission staff—dozens of specialists, consultants to the Commission, and persons in other government departments and agencies with expertise in specialized areas. In

the present case the staff sought and obtained further information from Consumers and numerous amendments and additions to the Report were made. *See* Staff Safety Evaluation, R.2606 *et seq.* In addition, the Act required (§§ 29, 182b, 42 U.S.C. § 2039, 2232 (b)) that the Preliminary Safety Analysis Report be reviewed and evaluated by an independent Advisory Committee of 15 consultants that had been established by Congress to advise the Commission on safety matters. This was done, and the Advisory Committee issued, first, a report concluding that the two nuclear reactors proposed "can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public" (R. 2616), and, later, a supplemental report reaffirming that conclusion (R. 2618).

The work of the company, of the staff and of the Advisory Committee was then subjected to scrutiny in public hearings. Consumers, Dow (R. 4829) and the staff (R. 9121-9167, 9715-9721) have each answered interrogatories propounded by intervenor Saginaw (Consumers' answers ran to some 700 pages, R. 5588-6408), and the Preliminary Safety Analysis Report, the Staff Safety Evaluation, including the material on which it had relied, the Advisory Committee reports, and all documents in the Commission's Public Document Room were available to all interested parties. These health and safety hearings lasted 17 days.

The examination of environmental issues happened in this case to take a somewhat different route, but an equally detailed and exhaustive evaluation was conducted. Because the Commission was required to issue new NEPA regulations after the decision in *Calvert*

Cliffs Coordinating Committee v. *Atomic Energy Commission,* 449 F.2d 1109 (D.C. Cir. 1971), the NEPA issues were initially considered after the health and safety hearings had been concluded.[6] Pursuant to these regulations, Consumers filed a 1,600-page report supplementing its filing under the old regulations. In response to inquiries from the staff when it examined the supplemental report, additions and amendments were made (R. 12,612; 15,697; 16,044; 16,293). Then, as with the Preliminary Safety Analysis Report, the staff conducted its own evaluation and filed its own Draft Environmental Statement for public comment (R. 16,152). When comments had been received—from both government agencies and the public—the staff released its Final Environmental Statement (R. 17,355), as well as all the comments it had received. Then, as with the health and safety issues, the staff's conclusions were tested in 14 days of public hearings.

The hearings on both sets of issues were held before an Atomic Safety and Licensing Board created pursuant to § 191 of the Act (42 U.S.C. § 2241). The Licensing Board's lengthy decision on both health and safety and environmental matters (Joint App. pp. 184-222) dealt with every issue of fact on which the intervenors had introduced evidence or engaged in cross-examination. On environmental issues, the Licensing Board recognized that it had the responsibility to "independently consider the final balance among conflicting environmental factors in the record"

[6] There has been no suggestion in this proceeding that the Commission's NEPA regulations (10 C.F.R. Part 51) are in any way inadequate. Indeed, they have been commended as a model for other agencies. *See Green County Planning Board* v. *Federal Power Commission,* 455 F.2d 412, 422 (2d Cir. 1972).

(Joint App. p. 205).[7] Its decision did in fact condition its order authorizing the issuance to Consumers of construction permits on certain changes in the plant and the imposition of responsibility on Consumers for certain environmental studies (Joint App. pp. 184-222).

The Commission's procedure provides an appellate review of the decision of the Licensing Board by an Atomic Safety and Licensing Appeal Board. 10 C.F.R. §§ 2.762, 2.765. Each of the intervenor's exceptions to the Licensing Board's decision was reviewed, and in three extensive opinions by the Appeal Board, the decision of the Licensing Board was affirmed (Joint App. pp. 223-321). The Commission did not review or amend the actions of the Appeal Board, and its decision became the final decision of the Commission, 10 C.F.R. §§ 2.760, 2.786. Later, however, as a result of an intervenor's motion to reopen the hearings, the Commission itself did deal in an extensive and detailed opinion with the exceptions relating to energy conservation—one of the issues raised by the intervenors and pressed in the court below (Joint App. pp. 324-345).

Administrative decisions so reached should be set aside only for substantial procedural or substantive

[7] The Licensing Board noted (Joint App. p. 190) that because the intervenors had failed to comply with the Commission's regulations with respect to proposed findings and conclusions, they had "greatly complicated" the Board's work. However, rather than deal with this default by striking their intervention and treating Consumers' application as uncontested, the Board, as indicated, treated as contested fact issues all those on which the intervenors had introduced affirmative testimony or engaged in cross-examination.

reasons. *Consolo* v. *Federal Maritime Commission,* 383 U.S. 607, 620. Those reasons are lacking here. Rather, the court below appears to have disagreed with the judgment that the Commission is authorized to make, and to have reached out for, and in one instance virtually contrived, issues to justify remanding the proceedings for further extensive hearings and new decisions. This should not be sanctioned by this Court. *Federal Power Commission* v. *Florida Power & Light Co.,* 404 U.S. 453, 466.

We turn, then, to those issues.

II

THE COMMISSION PROPERLY AND ADEQUATELY DEALT WITH THE ENERGY CONSERVATION ISSUE

NEPA requires that an environmental impact statement consider "alternatives to the proposed action." §§ 102(C)(iii) and 102(D), 42 U.S.C. §§ 4332(C)(iii), 4332(D). The court below concluded that the Commission was "capricious and arbitrary" in its treatment of "energy conservation" as an alternative, and that a remand for further consideration of that matter was required. The court's conclusion was wholly unjustified.

A. The Commission Dealt Properly With the Energy Conservation Issue.

The need for the electric power to be generated at the Midland plant was extensively considered. The environmental report prepared by Consumers contained an analysis of projected need broken down by customer classes and uses, and as to some large industries by individual customers (R. 12,612; updated R. 15,697; 16,044; 16,293). Those estimates were of course

reviewed by the Commission staff, which in preparing the Commission Draft Environmental Statement consulted with agencies "with jurisdiction by law or special expertise with respect to" environmental impact (42 U.S.C. § 4332)—the Environmental Protection Agency (R. 16,285, 17,358, 17,516, 17,572) and the agencies having regulatory authority over electric utilities. These included the Michigan Public Service Commission, which regulates all of Consumers retail sales of electricity and must approve the issuance of its securities (Mich. Stat. Ann. Title 22, §§ 13(6), 101); and the Federal Power Commission, which regulates sales in interstate commerce (16 U.S.C. § 824, *et seq.*). None suggested that the demands for energy intended to be met by the Midland plant could be reduced by "energy conservation" measures. In fact, at the hearing a witness from the Federal Power Commission agreed with Consumers' projections of need. (Joint App. p. 207).

At the hearing before the Licensing Board intervenor Saginaw submitted a Statement of Environmental Contentions—119 in number (Joint App. pp. 1340-1396). Of these, some 17 were subsequently alleged to relate to "energy conservation," although that phrase nowhere appears in the intervenor's Statement. The Licensing Board dealt with some of the 17 on the merits. Contentions 31, 47, 75 and 76 asserted in various ways that it was appropriate to determine whether Consumers had artificially enhanced electric demand by promotional advertising or other promotional activities (Joint App. pp. 1356-1357, 1366-1367, 1379-1380). The intervenor offered no evidence to sustain the contentions, and on the record the Licensing Board found that "postulated demand is made up of normal industrial and residential use" (Joint App.

p. 207). Another contention (No. 88, last sentence) raised the question whether the projections of use considered the possibility that the rate structure might be revised to make large uses of electricity more expensive (Joint App. p. 1384). No evidence was offered by intervenor on the issue, and the Board found that Consumers' "projections of need are reasonable" (Joint App. p. 207).

The criticism by the court below is, however, directed not at these rulings, but at the decision by the Licensing Board to decline to consider "whether an appropriate alternative to satisfying the demand [presented by Consumers' analysis] would be to set limits on particular uses of electricity" (Joint App. p. 207). The Licensing Board concluded that "[I]t is, in our view, beyond our province to inquire into whether the customary uses being made of electricity in our society are 'proper' or 'improper' " (*ibid.*). The Appeal Board reviewed the ruling, and agreed (Joint App. p. 306).

The propriety of this aspect of the Licensing Board decision was again raised in a motion for "clarification" filed by intervenor Saginaw while the proceeding was awaiting argument in the court below. The occasion was the decision by the Commission in *Niagara Mohawk Power Company,* 6 A.E.C. 995 (1973), in which the Commission had dealt for the first time with the relevance in licensing proceedings of "energy conservation" issues, and issued a ruling which, recognizing that unresolved legal problems were presented, concluded that such issues should not be excluded from the proceedings. In response to the Saginaw motion, which the Appeal Board referred to the Commission

itself for disposition, the Commission reviewed in detail each of Saginaw's contentions which might be said to deal with "energy conservation." As to many of them, it found, as already noted, that the Board had entertained and properly disposed of the issues raised. As to other contentions—the contentions as to which the court below found the Commission "capricious and arbitrary"—the Commission made several answers.

First, it dealt with the contention that the Licensing Board should have considered the environmental effects of the customers' electric energy usage. Contention 34, for example, asserted that The Dow Chemical Company, which will receive electricity from Consumers integrated electric system and process steam from the Midland plant, produces certain products which may be harmful to the environment, and that the proceeding must consider the social value of the end uses of the power to be produced. That argument, it concluded, was not a legitimate "energy conservation" issue—Dow would presumably replace any product produced at its plant which was discontinued for environmental reasons with another product and its energy requirements would not be affected (Joint App. p. 338). Moreover, "prediction of the environmental effects of the uses of electricity is highly speculative" (Joint App. p. 338). The Licensing Board, it concluded, was not required "to entertain contentions concerning alleged environmental effects of customer uses of electricity" (Joint App. p. 339)—although it noted that the Board has invited Saginaw to recast its contentions of this character into more specific terms, which Saginaw declined to do. (*Ibid.*)

Second, the Commission found several contentions too vague, as stated, to raise an issue—Contention 32,

for example: "the possibility of changing the present social stimuli to society which could result in decreased demand for electricity"; Contention 33: "to investigate ways of generating electricity through conventional means or other means not now known to man which could result in less risks and costs than the generation of electricity through nuclear power plants." (Joint App. pp. 337, 340). Saginaw, it noted, had declined the invitation by the Licensing Board to make more specific submissions.

Third, it dealt with the criticism by Saginaw of the latter's failure to comply with the Commission's procedural rules. Saginaw had not participated at all in the fourteen days of hearings before the Licensing Board on environmental issues, and in addition, when directed by the Licensing Board to file proposed findings of fact and conclusions of law, Saginaw stated that it had "no conventional findings of fact to set forth." As the Commission stated (Joint App. p. 342), "Saginaw's complaint that it was not granted a hearing on alleged energy conservation issues comes with ill grace."

The court below was particularly critical of the Commission's response to Saginaw's argument that its defaults and failures were irrelevant because the Licensing Board was required to consider all environmental issues, whether contested or not. The criticism is entirely unwarranted. The Commission recognized its duty to develop an adequate record upon which to assess environmental impact. It further concluded, however, that workable subsidiary rules for the orderly conduct of proceedings (Joint App. p. 344)—

> "must take into account that energy conservation is a novel and evolving concept. NEPA 'does not require a "crystal ball" inquiry.' *Natural Resources Defense Council* v. *Morton,* supra. at 837. This consideration has led us to hold that we will not apply *Niagara* retroactively. As we gain experience on a case-by-case basis and hopefully, feasible energy conservation techniques emerge, the applicant, staff, and licensing boards will have obligations to develop an adequate record on these issues in appropriate cases, whether or not they are raised by intervenors.
>
> "However, at this emergent stage of energy conservation principles, intervenors also have their responsibilities. They must state clear and reasonably specific energy conservation contentions in a timely fashion. Beyond that, they have a burden of coming forward with some affirmative showing if they wish to have these novel contentions explored further." (Footnotes omitted)

As to what that "affirmative showing" must be, the Commission added, in a footnote (Joint App. p. 344):

> "[27] We do not equate this burden with the civil litigation concept of a *prima facie* case, an unduly heavy burden in this setting. But the showing should be sufficient to require reasonable minds to inquire further. Compare *United Church of Christ* v. *FCC, supra.*"

For the court below to characterize this as essentially requiring intervenors "to prove an alternative satisfies the 'rule of reason' before the Commission will investigate it" (Joint App. p. 100) is a distortion. To characterize it as "capricious and arbitrary" is to deprive those words of meaning. The court below, without discussion of the nature of Saginaw's contentions and treating them all together as an "energy conservation" issue, likewise treated them all as summarily

rejected, which of course was not the case.[8] Similarly, its criticism of what it termed the Commission's "threshold test" took no account of the nature of Saginaw's contentions, nor indeed that the Commission had satisfied even what the court required (Joint App. p. 101), that "the Commission must explain the basis for each conclusion that further consideration of a suggested alternative is unwarranted." The long, careful opinion by the Commission on Saginaw's motion for clarification (Joint App. pp. 324-345) is a model of just such an explanation as the court appears to demand. We commend it to the Court. The opinion does not, as the court below states, obscure discussion of energy conservation issues by "conflating" them with more exotic "end product" arguments later abandoned (Joint App. p. 96, n.8). To the contrary, energy conservation is defined as including any "measure to curtail the demand for electricity to a level at which the proposed facility would not be needed."[9]

"Energy conservation" is not the simplistic issue of the court below. The Commission pointed out that "the phrase 'energy conservation' has a deceptively simple ring" and taken literally "suggests a virtually limitless merger of possible actions and developments" (Joint App. p. 331).[10] Hence, recognizing that precise

[8] The court below stated: "The Licensing Board rejected energy conservation alternatives as 'beyond our province. . . .' On administrative appeal, the Licensing Board's decision not to explore conservation alternatives was affirmed." (Joint App. pp. 94-95).

[9] The court below appears to suggest that this meant that the Commission would consider only evidence which would "*totally* alleviate the need for . . ." the facility (Joint App. p. 98, n. 10; emphasis in original). However, a review of the Commission's opinion shows that no evidence relating to energy conservation as defined was barred because of its limited impact.

[10] The Federal Power Commission has similarly noted, in its initial effort to deal with energy conservation, that "conservation of energy is currently an evolving concept without a uniformly accepted definition." See 38 Fed. Reg. 31,963; 31,964 (Nov. 13, 1973).

guidelines governing what kinds of energy conservation issues should be opened in individual licensing proceedings were neither possible nor desirable, it stated basic considerations which it would apply (Joint App. p. 332):

> "Purported energy conservation issues must meet a threshold test—they must relate to some action, methods or developments that would, in their aggregate effect, curtail demand for electricity to a level at which the proposed facility would not be needed. As discussed hereafter, several of Saginaw's alleged 'energy conservation' issues have nothing to do with projected demand. Beyond that, the issue must pertain to an alternative that is 'reasonably available.' *Natural Resources Defense Council* v. *Morton,* 458 F.2d 827, 834 (C.A. D.C. 1972). Furthermore, the impact of proposed demand must be susceptible to a reasonable degree of proof. Largely speculative and remote possibilities need not be weighed against a convincing projection of demand. Here, as with many other issues under the National Environmental Policy Act of 1969, a rule of reason applies. *See Natural Resources Defense Council* v. *Morton, supra.*" (Footnote omitted)

Moreover, as the subsequent review of the hearing record by the Commission shows, the contentions belatedly characterized as "energy conservation" comments were "long on rhetoric and short on specificity," "redundant," raised "multiple and unrelated issues" and "did not point up any such common themes." Joint App. pp. 333. The contentions were not simply

written comments to which the agency reacted in writing; they were, on the contrary, made in the context of a full hearing to which intervenors were parties. Indeed, the Licensing Board in an attempt to deal with the problem, invited the Saginaw intervenors to recast or brief their contentions (R. 25,317; 25,320-322). Saginaw not only failed to do so, it failed even to appear at the fourteen days of hearings on environmental matters. Accordingly, the Licensing Board and the Appeal Board attempted to divide the contentions into groups and so deal with them, except where it was necessary to refer to specific contentions. The Commission later handled the matter in the same way (Joint App. pp. 334-341).

Consequently, what the record shows is not that the energy conservation comments were ignored or that they were deliberately "conflated" with other comments in order to slough them off or that the agency unduly burdened intervenors with its own duties. To the contrary, to a large extent the history of this proceeding is an effort by successive organs of the agency to identify, understand and grapple with a "diffuse barrage" (Joint App. p. 334).

B. The Court Below Seriously Misconstrues What Was Required by NEPA in These Proceedings

The holding of the court below that the intervenors' comments were not adequately addressed turned in large part on its view of the procedure it believes NEPA imposes on an agency when it receives comments on a draft environmental impact statement. NEPA refers only to the "final impact statement, for no other kind of statement is mentioned in the statute." *Aberdeen & Rockfish R. Co.* v. *SCRAP*, 422

U.S. 289, 320. And the only requirement that NEPA does impose upon agencies before issuing that final impact statement is to consult federal agencies with "jurisdiction by law or special expertise." (42 U.S.C., §4332(2)(C)). Accordingly, it is wholly inappropriate to hold that NEPA mandates, with the precision of a procedural code, three precisely defined steps which must be followed after a *draft* statement is issued.[11]

Moreover, the holding is particularly inappropriate in the present case. At the time the draft and final environmental impact statements were prepared in this proceeding the Guidelines for Federal Agencies under the National Environmental Policy Act (CEQ Guidelines) did not even require the preparation of draft statements.[12] (36 Fed. Reg. 7724, April 23, 1971).

We recognize that NEPA requires that environmental impacts and effects be considered when an impact statement is prepared, and we do not suggest that an agency is free to ignore material, comprehensible and

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[11] These are (i) a preliminary investigation of any "colorable alternative" contained in an intervenor's comments on a draft environmental statement;" (ii) "a rational judgment as to whether it is worthy of detailed consideration in the . . . [final] EIS;" and (iii) an explicit explanation of "the basis for each conclusion that further consideration of a suggested alternative is unwarranted." Joint App. p. 100-102.

[12] The CEQ Guidelines then in effect contemplated that some agencies would use draft statements and contained provisions relating to the use of such draft statements (Sections 7, 10(e)) and for forwarding copies to the CEQ "when prepared" (Section 10 (b)). However, they contained no provision similar to Section 1500.7(a) of the guidelines subsequently adopted and now in effect, which specify that: "Each environmental impact statement should be prepared and circulated in draft form for comment. . . ." (38 Fed. Reg. 20,550, 20,552, August 1, 1973)

timely comments or information concerning such matters. However, neither NEPA itself nor the CEQ Guidelines prescribe a ritual which must be followed by an agency in reacting to such comments or information. If in fact an agency deals with comments in a rational and responsible manner that is all that is required. The Commission and its subordinate arms did so in this proceeding. (See pp. 23 to 26, *supra.*)

The court below also erred in criticizing the statement by the Commission that it would not apply its *Niagara Mohawk* decision "retroactively to cases which had progressed to final order and issuance of construction permits before *Niagara* was decided" (Joint App. p. 337).[13] The court below admitted that "agencies sometimes apply changes in their discretionary interpretations of their governing statutes only prospectively in order to avoid unfairness" but NEPA, it concluded, required a contrary result (Joint App. p. 98, n.9):

> "But that power cannot be stretched to permit disavowal of clear obligations a statute such as NEPA imposes on the agency itself. The Commission had no power to dispense with such consideration of energy conservation as NEPA required as of the time it was enacted in 1969, at least in those cases where the issue had been raised."

NEPA, of course, contains nothing about energy conservation. It is a "vaguely worded statute" which "can hardly be termed precise." *Kleppe* v. *Sierra Club,*

[13] The statement was *obiter* only, since the Commission noted that the decision of the Licensing Board on the issue raised was consistent with the *Niagara Mohawk* decision (*ibid.*). The statement by the court below to the contrary is erroneous (Joint App. pp. 336-337).

427 U.S. 390, 421 (Marshall, J., concurring and dissenting). "[T]he general substantive policy of the Act is a flexible one. It leaves room for a responsible exercise of discretion and may not require particular substantive results in particular problematic instances." *Calvert Cliffs,* 449 F.2d, *supra* at 1112. It is singularly inappropriate to refer to energy conservation as a requirement of NEPA "as of the time it was enacted in 1969" or to the Act's "clear obligations" respecting energy conservation.

Nor can such "clear obligations" be found in other customary sources of interpreting NEPA. The court below noted that on June 19, 1973, the Federal Power Commission required energy conservation to be considered in applications to build hydroelectric facilities. 18 C.F.R. App. A. § 8.2 (1975), 38 Fed. Reg. 15,946, 15,949 (June 19, 1973).[14] This was over a year and one-half after the draft environmental statement for Midland had been completed, fifteen months after the final environmental statement, and more than a year after the Midland hearing had ended. Of course, the FPC regulation was not made retroactive. 38 Fed. Reg. 15,946. If anything, this is an example of the developmental nature of NEPA rather than a requirement to consider energy conservation "as of the time it was enacted in 1969." This is also demonstrated by the fact that the CEQ Guidelines (36 Fed. Reg. 7724, April 23, 1971) in effect when the Midland FES and hearing were completed did not refer to energy conservation.

[14] The only other "authority" cited by the court below to support its interpretation of NEPA was the *1976* report of the 15th American Assembly on Nuclear Energy which concluded that more efficient conservation of energy could reduce power demand to some extent in the future. (Joint App. p. 102, n.15)

Section 1500.8(a)(4) of the Guidelines subsequently adopted (38 Fed. Reg. 20,550, 20,554, August 1, 1973) for the first time indicated that impact statements should consider "alternatives that will significantly conserve energy." However, this requirement was made applicable to "draft and final impact statements filed with the Council after January 28, *1974*." 38 Fed. Reg., *supra* at 20,557; 38 Fed. Reg. 21,265, August 7, 1973. The Council itself characterized this reference to energy conservation as one of the "major changes" between the 1973 and the previous, 1971, Guidelines.[15]

It is appropriate to add that NEPA is less "demanding" in a case such as the present one, where what is before the Commission is a proposal for private action where the only "major federal action" to be taken is approval or disapproval of that private action. *Kleppe* v. *Sierra, supra* at p. 419, n.1 (Marshall, J., concurring and dissenting). Finally, it makes no sense whatever to apply a rigid rule requiring retroactive application of Commission decisions in what the Commission accurately characterized as a "novel and evolving" area where the Commission recognized that it would act more affirmatively "as we gain experience on a case-by-case basis" and "as feasible energy techniques emerge" (Joint App. p. 344).

We respectfully submit that the court below erred in remanding the proceeding to the Commission for further proceedings on this issue.

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[15] See August 2, 1973 Memorandum for Heads of Agencies issued by the CEQ and entitled "Revision of Agency Procedure for Preparation of Environmental Impact Statements, Attachment A, entitled "Major Changes Between New CEQ Revised NEPA Guidelines and Previous April, 1971 Guidelines on the Preparation of Environmental Impact Statements," p. 2, para. 6, App. p. A-80.

III

THE REMAND ON THE ACRS ISSUE WAS ERRONEOUS

The Advisory Committee on Reactor Safeguards is established by §182(b) of the Act (42 U.S.C. §2232 (b)). The Committee consists of a group of independent, outside experts which is required to review each application for a construction or operating license to determine whether it can be operated with a reasonable assurance of safety. As indicated above, the Advisory Committee reviewed Consumers' initial application, and its two reports were made a part of the public record (R. 2616, 2618).

The issue as to the Advisory Committee arises from the holding by the court below that its reports were inadequate, that the Licensing Board should have, *sua sponte,* returned them to the Advisory Committee for further elaboration (Joint App. p. 108), and that since the Licensing Board had failed to do so the matter must be remanded to the Commission for further proceedings (Joint App. p. 109).

The inadequacy, in the judgment of the court below, is that the Advisory Committee, at the conclusion of a five-page report discussing a variety of design problems and suggestions for modifications in Consumers' plans, concludes (Joint App. pp. 105-106):

> "Other problems related to large water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee believes that resolution of these items should apply equally to the Midland Plant Units 1 & 2.
>
> "The Committee believes that the above items can be resolved during construction and that, if due consideration is given to these items, the nu-

clear units proposed for the Midland Plant can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public."

It is fair to say that this issue is almost entirely contrived by the court below. The opinion below, after referring to the "other problems" sentence just quoted, recites that "Saginaw requested the Licensing Board to permit discovery into these matters." That statement is grossly misleading. Saginaw's discovery requests took the form of 337 interrogatories, various document demands, subpoenas and requests for depositions directed to Advisory Committee members (Joint App. p. 106). The fact is, however, that this elaborate attempt was not an attempt to discover "into these matters." The Saginaw request did not plead ignorance of, or the availability of, information as to the "other issues." Indeed, since all of the Advisory Committee's reports are publicly available at the Commission's Public Document Room, there would have been no basis for such a complaint. Intervenor Saginaw directed its discovery efforts to quite a different object —to find the basis upon which the Advisory Committee had reached its five pages of conclusions and suggestions. As the brief for the intervenors on this issue in the court below stated (p. 17): "petitioners' requests [for discovery] focused not only upon ACRS views which had been communicated to the Staff, but also upon the ACRS reasoning process—communicated or otherwise—underlying its conclusions." *That* demand —for discovery into the reasoning process of the Committee—was properly denied by the court below (Joint App. pp. 108-109).

But contrived or not, there is no warrant for the holding below that the "other problems" referenced in

the Advisory Committee's report required the Licensing Board to reject it. There is even less warrant for the holding that seven years later the reference in the report required a remand of the case to the Commission for further proceedings. The Act requires that the Advisory Committee prepare a report, and that it be made public.[16] That was done. Under the Act, the report is not evidence; it indicates, rather, that at an early stage in the proceedings an expert committee has had the opportunity to examine the proposed facility and advise the Commission and its staff. Neither the Licensing Board nor the Appeal Board relied upon the Advisory Committee reports as evidence. The Licensing Board stated (Joint App. p. 186 n.2) that they "were admitted into the record . . . as required by law (42 U.S.C. 2282(b)) for the sole purpose of showing compliance with the statute and not as evidence of the truth of any statement therein." The Appeal Board agreed (Joint App. p. 277). To declare, years later, that the Licensing Board made a fatal error in failing, *sua sponte,* to send the Advisory Committee reports back to the Committee for explication of the "other problems" is judicial intervention run riot.

Perhaps it is fair to add that, whatever may be the disposition of this cause by this Court, Advisory Committee reports will, in the findings, not be likely to contain cross-references to unidentified earlier reports. To say that, however, is in no sense to justify what the court below has done. Judicial condemnation of a long and meticulous administrative proceeding because of

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[16] The court below in its remand order has added a gloss to the Act—that the Advisory Committee couch its further report in words "understandable to a layman" (Joint App. p. 108). In the context of nuclear technology, such a mandate becomes only a source of controversy—what kind of a "layman" is referred to?

the alleged substantive inadequacy of a collateral aspect of that proceeding is unconscionable.

IV

THE REMAND IN THE COURT BELOW ON THE "FUEL CYCLE" ISSUE WAS IN ERROR

"Fuel Cycle," in the present context, involves the entire course of events relating to the fuel for a nuclear reactor, beginning with its mining and including its milling, enrichment, fabrication, transportation to the reactor, transportation of spent fuel to a reprocessing facility and disposal of waste. The issue here relates to the latter part of that cycle—whether the Commission properly disposed of the question as to the environmental effects of the reprocessing of spent fuel and the disposition of wastes which would be involved in the operation of the Midland project. While the brief for Vermont Yankee will deal at length with this issue, it is appropriate that we also set forth the reasons for our belief that the Commission did adequately and properly deal with the issue, and that the court below erred in remanding the proceeding to the Commission for further consideration.

In the present case, the Licensing Board, in approving Consumers' construction permit in December 1972, concluded that environmental questions relating to the fuel cycle issue need not consider the environmental aspects of the reprocessing of the spent fuel or the ultimate disposition of nuclear wastes, but rather should be confined to the environmental aspects involved in the transportation of fresh fuel to, and spent fuel from, Consumers' plant, transportation of packaged radioactive materials to burying grounds, and the environmental effects associated with handling of fuel

at the plant site (R. 17,272, 22,406). In May 1973, the Appeal Board affirmed that ruling (Joint App. p. 241). The Appeal Board had earlier reached the same conclusion in the *Vermont Yankee* proceedings (Joint App. p. 115).

Contemporaneously, however, the Commission itself recognized the desirability of dealing with the environmental effects of a nuclear plant in respect to reprocessing and waste storage and disposal. While agreeing with the decisions of the Appeal Board that full exploration of these issues was inappropriate in individual licensing proceedings, it proposed by rulemaking to quantify the environmental consequences of an individual nuclear reactor on this part of the fuel cycle, to the end that the results reached by the rule could then be applied in individual licensing proceedings. A rulemaking proceeding for that purpose was announced in November 1972 (Joint App. p. 352). The result of the proceeding was an amendment to its regulation implementing NEPA (10 C.F.R. Part 50, Appendix D) which quantified and set out in a table (S-3) the environmental effects of an individual reactor in relation to reprocessing and waste disposal. 39 Fed. Reg. 14,188 (April 22, 1974), Joint App. pp. 385-400. The Commission also concluded that because the environmental effects of a single reactor were essentially insignificant, there was no reason to reopen prior cases, including the present one. *See* Joint App. p. 395; *see generally Potomac Electric Power Co.,* 8 A.E.C. 79-85 (1974).

The court below did not take issue with the conclusion of the Commission that consideration of the environmental effects of the reprocessing and waste disposal aspects of the fuel cycle was properly consid-

ered by the Commission to be generic in nature, and more appropriate for rulemaking than for separate examination and evaluation in each individual licensing proceeding. *Cf. Union of Concerned Scientists* v. *AEC,* 499 F.2d 1069 (D.C. Cir. 1974); *Ecology Action* v. *AEC,* 492 F.2d 998, 1002 (2d Cir. 1974). Its decision, rather, was that in the rulemaking proceeding the Commission has been "capricious and arbitrary," that the rule which the Commission had issued was therefore invalid, and that since the court did not accept the decision of the Appeal Board that the environmental effects of reprocessing and waste disposal need not be considered in the licensing hearing, the construction permit to Consumers had not been properly issued. The proceeding was remanded for either a valid rulemaking, or for further consideration in the licensing proceeding itself (Joint App. p. 40, n.17).

For the reasons set forth in the brief for Vermont Yankee (pp. 39-50), we believe that the court below erred in rejecting the decision of the Appeal Board that the environmental effects of whatever might be done with the spent fuel from the Midland rectors was more appropriately to be dealt with—as the Commission was and is dealing with it—in connection with a generic environmental impact statement on various reprocessing and waste management alternatives as they may be considered for licensing by the Commission. *See Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle,* NUREG-0116 (Supplement 1 to WASH-1248, Appendices B and C. *Cf. Kleppe* v. *Sierra Club,* 427 U.S. 390. Approval of the position of the Appeal Board would make the validity *vel non* of the rule promulgating Table S-3 irrelevant. But be that as it

may, the court below also was in error in finding the Commissions' rulemaking invalid.

Rulemaking by the Commission is governed by 5 U.S.C. § 553. *Siegel* v. *AEC,* 400 F.2d 778, 786 (D.C. Cir. 1968). Section 553 provides for a legislative-type hearing—one that does not require that participants be afforded the right of cross-examination or discovery. *United States* v. *Allegheny-Ludlum Steel Corp.,* 406 U.S. 742; *United States* v. *Florida East Coast Ry. Co.,* 410 U.S. 224; Bauser, *The Development of Rulemaking Within the Atomic Energy Commission: The Nuclear Regulatory Commission's Valuable Legacy,* 27 Ad. Law Rev. 165, 166-170 (1975).

Rulemaking by the Commission involving NEPA problems stands on no different footing than rulemaking involving the many other issues with which it must be concerned. The National Environmental Policy Act (42 U.S.C. § 4332, *et seq.*) does not modify the Administrative Procedure Act, nor in any other way impose requirements for rulemaking which are more stringent. *United States* v. *SCRAP,* 412 U.S. 669, 694. Indeed, it is important to bear in mind, in specifying instances such as the present where rulemaking involves NEPA, that, as this Court has recently affirmed in *Kleppe* v. *Sierra Club,* 427 U.S. 390, 410, n.21:

> "Neither the statute nor its legislative history contemplates that a court should substitute its judgment for that of an agency as to the environmental consequences of its action. . . . The only role for a court is to insure that the agency has taken a 'hard look' at environmental consequences; it cannot 'interject itself into the area of discretion of the executives as to the choice of actions to be taken'".

The decision below invalidating the Commission's rule cannot be squared with §553, with *SCRAP* or with *Kleppe*. The rulemaking proceeding, as indicated above, was begun with a notice published in the *Federal Register* on November 15, 1972 (37 Fed. Reg. 24,191, Joint App. p. 352) concerning the purpose of the hearing to be held. The notice announced the availability of a staff report "Environmental Survey of the Nuclear Fuel Cycle" which described the methodology and assumptions used by the staff in arriving at its findings, which were set out in tabular form in Table S-3. The notice solicited comments, and stated that it would consider them at a legislative-type hearing. A later notice in the *Federal Register* set up a Hearing Board and provided that participants in the hearing could make oral statements as well as written submissions. 38 Fed. Reg. 49. All interested parties had an opportunity to become parties to the rulemaking proceeding. *Id.* at p. 50.

Weeks before the hearings opened, the Commission made available in its Public Documents Room the background material for the staff Survey, including the staff's administrative and prior drafts. 39 Fed. Reg. 14,188; 14,190-91. The only request for additional documents which the Commission received was promptly honored. See 39 Fed. Reg. 14,189, n.2.

At the hearing, on February 1-2, 1973 (Joint App. pp. 700-1023) testimony was presented by the staff, by the Natural Resources Defense Council (represented at the hearing by Consolidated National Intervenors), and by several other participants, and written comments were received from a large number of individuals and groups. See generally the pre-hearing proceedings, Joint App. pp. 655-699. No testimony or comment was excluded for any reason. After reviewing the record and other related data available to it, the Commission revised the Survey, revised Table S-3, and issued its Uranium Fuel Cycle Rule, which required that the values set out in Table S-3 be factored into the cost-benefit analysis for all proposed nuclear power plants after June 6, 1974. 39 Fed. Reg. 14,188, 10 C.F.R. §51.20(e).

The court below found that all of this was not sufficient to "ventilate the issues." While there are overtones in the majority opinion that suggest that the court felt that the evidence adduced at the hearings was not adequate to support the numerical values in Table S-3, the court's "capricious and arbitrary" characterization of the Commission's action appears to have been based on its view that a legislative-type hearing would not suffice, and that a "more sensitive, deliberate" procedure was required (Joint App. pp. 44, 67). The court declined, however, to specify what special procedures, or combinations thereof, would have sufficed.

The decision, we submit, cannot be reconciled with the mandate of §553, as interpreted by the Court in *Allegheny-Ludlum* and *Florida East Coast, supra.* Indeed, the hearing which was provided, the material which was available, the opportunities which were afforded participants, the supplying of further documents when requested, far exceeded the minimum standard of that section of the APA. Moreover, the court below took no account of the fact that it was dealing with a NEPA rule, which, as indicated above, requires only that the agency involved take a "hard look." To assert that the Commission has not fully met that standard is to close one's eyes to reality.

Moreover, the decision cannot fairly be reconciled even with the earlier decisions of the court below which have indicated that a rulemaking participant may, in certain situations, demand procedures which exceed statutory requirements in order to develop a complete record. *E.g., International Harvester Co.* v. *Ruckelshaus,* 478 F.2d 615 (D.C. Cir. 1973); *American Airlines, Inc.* v. *CAB,* 359 F.2d 624 (D.C. Cir. 1966), *cert. denied,* 385 U.S. 843." However, even under those decisions the objectors must have made "circumscribed and justified requests" for other procedures and must have demonstrated that on "explicit points" the procedure they request is essential. *International Harvester,* 478 F.2d at p. 631. As Professor Davis has noted, "the case law is clear that general requests for opportunity to cross-examine may be denied." *Administrative Law of the Seventies* (Supplemental Administrative Law Treatise) § 6.01-5, p. 191 (1976).

The court below asserted (Joint App. p. 44, n.25) that intervenors here had met that standard. On the contrary, as the court's own footnote reveals, the intervenors' legal brief, to which the court refers, contains only a broad demand for "the right to cross-examine and to have discovery" on the issues, and comments on the testimony of Dr. Pittman, a staff witness on waste disposal issues:

> "We are not satisfied with Mr. Pittman's well intentioned, but, we think, not at all well explained position with regard to the ability to handle nuclear wastes for hundreds of thousands of years."

One may legitimately wonder how cross-examination would permit a "harder look" at what the court below itself recognized as being "basic philosophical issues concerning man's ability to make commitments which will require stable social structures for unprecedented periods." Joint App. p. 63. One may more confidently accept the Commission's own conclusion (39 Fed. Reg. 14,189):

> "All parties were fully heard. Nothing offered was excluded. The record does not indicate that any evidentiary material would have been received under different procedures. Nor did the proponent of the strict 'adjudicatory' approval make an offer of proof—or even remotely suggest—what substantive matters it would have developed under different procedures."

The court below might more appropriately have heeded the admonition it gave to a similiar protest in *American Airlines, Inc.* v. *CAB, supra.* Commenting on the decision of this Court in *United States* v. *Storer Broadcasting Co.,* 351 U.S. 192, the court said (359 F.2d at p. 629):

> "It rests on a fundamental awareness that rule making is a vital part of the administrative process, particularly adapted to and useful for sound

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[17] The attitude of the court below is not shared by other courts of appeal, which have found notices and comments adequate for Section 553 rulemaking. General Telephone Co. v. United States, 449 F.2d 846, 862-863 (5th Cir. 1971); California Citizens Band Ass'n v. United States, 375 F.2d 43, 50 (9th Cir. 1967), *cert. denied,* 389 U.S. 844; Phillips Petroleum Co. v. FPC, 475 F.2d 842 (10th Cir. 1973), *cert. denied sub nom.* Chevron Oil Co. v. FPC, 414 U.S. 1146; Buckeye Power, Inc. v. EPA, 481 F.2d 162, 170-172 (6th Cir. 1973); Duquesne Light Co. v. EPA, 481 F.2d 1, 6-7 (3d Cir. 1973). To the contrary, with the court below, are the Second and Fourth Circuits. See Natural Resources Defense Council v. NRC, 539 F.2d 824 (2d Cir. 1976), petition for certiorari pending No. 76-653; Appalachian Power Co. v. EPA, 477 F.2d 495, 503 (4th Cir. 1973).

> evolution of policy in guiding the future development of industries subject to intensive administrative regulation in the public interest, and that such rule making is not to be shackled, in the absence of clear and specific Congressional requirement, by importation of formalities developed for the adjudicative process and basically unsuited for policy rule making."

All of this is not to say, of course, that the environmental effects of reprocessing and waste disposal are not important. They are. Nor is it to say that anyone, whatever procedures might be invoked, could arrive at categorical and specific answers to the environmental questions. What it is to say is that the Commission, with what this Court has called "appropriate allowances for the inexactness of all predictive ventures" (*Kleppe* v. *Sierra Club,* 427 U.S. 390, 402, n.14) should not be subject to a second-guess by a court as to whether it had enough information before it to proceed.

V

THE "DOW" ISSUE

A final word is warranted on the comment by the court below that, on remand, "the Commission will take into account the changed circumstances regarding Dow's need for process steam, and the intended continued operation of Dow's fossil-fuel generating facilities" (Joint App. p. 109). The court did not, as urged by intervenors, find that the Commission had erred in its treatment of the Dow-Consumers relationship, and in the event this Court finds the Commission's actions otherwise valid, it need not be concerned with the "Dow" issue.

For the information of the Court, however, while the appeal in this case was pending in the court below, intervenors moved the Commission to reopen the proceedings because of alleged significant changes in Dow's commitment to take process steam and electric power from the Midland plant. The matter was investigated by the Commission, and three memoranda and orders were issued (Joint App. pp. 346-351). The Commission concluded (Joint App. p. 35):

> "We have carefully reviewed the relevant portions of these contracts and reaffirm our prior determination that there are no 'changed circumstances', as alleged by Saginaw, warranting a reopening of these proceedings. We think it sufficient to note that Dow has a contractural commitment to purchase large quantities of process steam from the completed facility, that substantial purchases of electricity are also contemplated, and that Dow's existing fossil-fueled facilities are to be maintained primarily on a stand-by basis."

The hearings pursuant to the mandate of the court below have dealt further with the Dow relationship, and the Commission itself is of course empowered either *sua sponte* or on motion by a party to again determine whether any modification of its position is warranted.

CONCLUSION

Wherefore, it is respectfully requested that the decision of the court below be reversed, and that the petitions to review the order of the Commission granting construction permits to Consumers for the Midland plant be dismissed.

Respectfully submitted,

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APPENDIX

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STATUTES:

Relevant Sections of Atomic Energy Act of 1954, Act of Aug. 30, 1954, Ch. 724, 68 Stat. 921, as amended, 42 U.S.C. §§ 2011 *et seq.* A-2

Relevant Sections of Energy Reorganization Act of 1974, Pub. L. 93-438, Ch. 73, 88 Stat. 1233, as amended, 42 U.S.C. §§ 5801 *et seq.* A-21

Relevant Section of National Environmental Policy Act of 1969, Pub. L. 91-190, 83 Stat. 852, as amended, 42 U.S.C. § 4332 ..... A-25

ADMINISTRATIVE ACTIONS:

Environmental Effects of the Uranium Fuel Cycle, General Statement of Policy, Nuclear Regulatory Commission, Docket RM-50-3, Fed. Reg. Vol. 41, No. 159, Aug. 16, 1976 ..... A-28

Licensing and Regulatory Policy and Procedures for Environmental Protection, Nuclear Regulatory Commission, Fed. Reg. Vol. 41, No. 202, Oct. 18, 1976 (10 CFR Part 51) A-37

Environmental Effects of the Uranium Fuel Cycle, Supplemental General Statement of Policy, Nuclear Regulatory Commission, Fed. Reg. Vol. 41, No. 219, Nov. 11, 1976 ..... A-52

Licensing and Regulatory Policy and Procedures for Environmental Protection, Nuclear Regulatory Commission, Fed. Reg. Vol. 42, No. 49, March 14, 1977 (Title 10 CFR, Ch. I, Part 51) A-57

Memorandum for Heads of Agencies, on Revision of Agency Procedures for Preparation of Environmental Impact Statements, Council on Environmental Quality, Aug. 2, 1973 ..... A-78

RELEVANT SECTIONS OF ATOMIC ENERGY ACT OF 1954. ACT OF AUG. 30, 1954, CH. 724, 68 STAT. 921, AS AMENDED. 42 U.S.C. §§2011 ET SEQ.

CHAPTER I. DECLARATION, FINDINGS, AND PURPOSE

SECTION 1. DECLARATION.—Atomic energy is capable of application for peaceful as well as military purposes. It is therefore declared to be the policy of the United States that—

a. the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security; and

b. the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.

SEC. 2. FINDINGS.—The Congress of the United States hereby makes the following findings concerning the development, use, and control of atomic energy:

a. The development, utilization, and control of atomic energy for military and for all other purposes are vital to the common defense and security.

c. The processing and utilization of source, byproduct, and special nuclear material affect interstate and foreign commerce and must be regulated in the national interest.

d. The processing and utilization of source, byproduct, and special nuclear material must be regulated in the national interest and in order to provide for the common defense and security and to protect the health and safety of the public.

e. Source and special nuclear material, production facilities, and utilization facilities are affected with the public interest, and regulation by the United States of the production and utilization of atomic energy and of the facilities used in connection therewith is necessary in the national interest to assure the common defense and security and to protect the health and safety of the public.

f. The necessity for protection against possible interstate damage occurring from the operation of facilities for the production or utilization of source or special nuclear material places the operation of those facilities in interstate commerce for the purposes of this Act.

g. Funds of the United States may be provided for the development and use of atomic energy under conditions which will provide for the common defense and security and promote the general welfare.

i. In order to protect the public and to encourage the development of the atomic energy industry, in the interest of the general welfare and of the common defense and security, the United States may make funds available for a portion of the damages suffered by the public from nuclear incidents, and may limit the liability of those persons liable for such loses.

SEC. 3. PURPOSE.—It is the purpose of this Act to effectuate the policies set forth above by providing for—

a. a program of conducting, assisting, and fostering research and development in order to encourage maximum scientific and industrial progress;

b. a program for the dissemination of unclassified scientific and technical information and for the control, dissemination, and declassification of Restricted Data, subject to appropriate safeguards, so as to encourage scientific and industrial progress;

c. a program for Government control of the possession, use, and production of atomic energy and special nuclear material, whether owned by the Government or others, so

directed as to make the maximum contribution to the common defense and security and the national welfare, and to provide continued assurance of the Government's ability to enter into and enforce agreements with nations or groups for the control of special nuclear materials and atomic weapons.

d. a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with the health and safety of the public;

e. a program of international cooperation to promote the common defense and security and to make available to cooperating nations the benefits of peaceful applications of atomic energy as widely as expanding technology and considerations of the common defense and security will permit; and

f. a program of administration which will be consistent with the foregoing policies and programs, with international arrangements, and with agreements for cooperation, which will enable the Congress to be currently informed so as to take further legislative action as may be appropriate.

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CHAPTER II ORGANIZATION

SEC. 26. GENERAL ADVISORY COMMITTEE; COMPOSITION; TENURE; MEETINGS; COMPENSATION.

There shall be a General Advisory Committee to advise the Commission on scientific and technical matters relating to materials, production, and research and development, to be composed of nine members, who shall be appointed from civilian life by the President. Each member shall hold office for a term of six years, except that (a) any mem-

ber appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed, shall be appointed for the remainder of such term; and (b) the terms of office of the members first taking office after August 1, 1946, shall expire, as designated by the President at the time of appointment, threee at the end of two years, three at the end of four years, and three at the end of six years, after August 1, 1946. The Committee shall designate one of its own members as Chairman. The Committee shall meet at least four times in every calendar year. The members of the Committee shall receive a per diem compensation for each day spent in meetings or conferences, and all members shall receive their necessary traveling or other expenses while engaged in the work of the Committee.

SEC. 29. ADVISORY COMMITTEE ON REACTOR SAFEGUARDS; COMPOSITION; TENURE; DUTIES; COMPENSATION.

There is established an Advisory Committee on Reactor Safeguards consisting of a maximum of fifteen members appointed by the Commission for terms of four years each. The Committee shall review safety studies and facility license applications referred to it and shall make reports thereon, shall advise the Commission with regard to the hazards of proposed or existing reactor facilities and the adequacy of proposed reactor safety standards, and shall perform such other duties as the Commission may request. One member shall be designated by the Committee as its Chairman. The members of the Committee shall receive a per diem compensation for each day spent in meetings or conferences, or other work of the Committee, and all members shall receive their necessary traveling or other expenses while engaged in the work of the Committee. The provisions of section 2203 of this title shall be applicable to the Committee.

CHAPTER IX. ATOMIC ENERGY LICENSES

SEC. 101. LICENSE REQUIRED.—It shall be unlawful, except as provided in section 91, for any person within the United States to transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, use, import, or export any utilization or production facility except under and in accordance with a license issued by the Commission pursuant to section 103 or 104.

SEC. 102. UTILIZATION AND PRODUCTION FACILITIES FOR INDUSTRIAL OR COMMERCIAL PURPOSES.—

a. Except as provided in subsections b. and c., or otherwise specifically authorized by law, any license hereafter issued for a utilization or production facility for industrial or commercial purposes shall be issued pursuant to section 103.

b. Any license hereafter issued for a utilization or production facility for industrial or commercial purposes, the construction or operation of which was licensed pursuant to subsection 104 b. prior to enactment into law of this subsection, shall be issued under subsection 104 b.

c. Any license for a utilization or production facility for industrial or commercial purposes constructed or operated under an arrangement with the Commission entered into under the Cooperative Power Reactor Demonstration Program shall, except as otherwise specifically required by applicable law, be issued under subsection 104 b.

SEC. 103. COMMERCIAL LICENSES.—

a. The Commission is authorized to issue licenses to persons applying therefore to transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, use, import, or export under the terms of an agreement for cooperation arranged pursuant to section 123, utilization or production facilities for industrial or commercial purposes. Such licenses shall be issued in accordance with the provisions of chapter 16 and subject to such conditions as the Commission may by rule or regulation establish to effectuate the purposes and provisions of this Act.

b. The Commission shall issue such licenses on a nonexclusive basis to persons applying therefor (1) whose proposed activities will serve a useful purpose proportionate to the quantities of special nuclear material or source material to be utilized; (2) who are equipped to observe and who agree to observe such safety standards to protect health and to minimize danger to life or property as the Commission may by rule establish; and (3) who agree to make available to the Commission such technical information and data concerning activities under such licenses as the Commission may determine necessary to promote the common defense and security and to protect the health and safety of the public. All such information may be used by the Commission only for the purposes of the common defense and security and to protect the health and safety of the public.

c. Each such license shall be issued for a specified period, as determined by the Commission, depending on the type of activity to be licensed, but not exceeding forty years, and may be renewed upon the expiration of such period.

d. No license under this section may be given to any person for activities which are not under or within the jurisdiction of the United States, except for the export of production or utilization facilities under terms of an agreement for cooperation arranged pursuant to section 123, or except under the provisions of section 109. No license may be issued to an alien or any corporation or other entity if the Commission knows or has reason to believe it is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. In any event, no license may be

issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public.

CHAPTER XIII. GENERAL AUTHORITY

SEC. 161. GENERAL PROVISIONS.—In the performance of its functions the Commission is authorized to—

a. establish advisory boards to advise with and make recommendations to the Commission on legislation, policies, administration, research, and other matters, provided that the Commission issues regulations setting forth the scope, procedure, and limitations of the authority of each such board;

b. establish by rule, regulation, or order, such standards and instructions to govern the possession and use of special nuclear material, source material, and byproduct material as the Commission may deem necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property;

c. make such studies and investigations, obtain such information, and hold such meetings or hearings as the Commission may deem necessary or proper to assist it in exercising authority provided in this Act, or in the administration or enforcement of this Act, or any regulations or orders issued thereunder. For such purposes the Commission is authorized to administer oaths and affirmations, and by subpena to require any person to appear and testify, or to appear and produce documents, or both, at any designated place. Witnesses subpenaed under this subsection shall be paid the same fees and mileage as are paid witnesses in the district courts of the United States;

• • •

f. with the consent of the agency concerned, utilize or employ the services of personnel of any Government agency

or any State or local government, or voluntary or uncompensated personnel, to perform such functions on its behalf as may appear desirable;

• • •

h. consider in a single application one or more of the activities for which a license is required by this Act, combine in a single license one or more of such activities, and permit the applicant or licensee to incorporate by reference pertinent information already filed with the Commission;

i. prescribe such regulations or orders as it may deem neeessary (1) to protect Restricted Data received by any person in connection with any activity authorized pursuant to this Act, (2) to guard against the loss or diversion of any special nuclear material acquired by any person pursuant to section 53 or produced by any person in connection with any activity authorized pursuant to this Act, to prevent any use or disposition thereof which the Commission may determine to be inimical to the common defense and security, including regulations or orders designating activities, involving quantities of special nuclear material which in the opinion of the Commission are important to the common defense and security, that may be conducted only by persons whose character, associations, and loyalty shall have been investigated under standards and specifications established by the Commission and as to whom the Commission shall have determined that permitting each such person to conduct the activity will not be inimical to the common defense and security, and (3) to govern any activity authorized pursuant to this Act, including standards and restrictions governing the design, location and operation of facilities used in the conduct of such activity, in order to protect health and to minimize danger to life or property;".

j. without regard to the provisions of the Federal Property and Administrative Services Act of 1949, as amended, except section 207 of that Act, or any other law, make such

disposition as it may deem desirable of (1) radioactive materials, and (2) any other property, the special disposition of which is, in the opinion of the Commission, in the interest of the national security: *Provided, however,* That the property furnished to licensees in accordance with the provisions of subsection 161 m. shall not be deemed to be properly disposed of by the Commission pursuant to this subsection;

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o. require by rule, regulation, or order, such reports, and the keeping of such records with respect to, and to provide for such inspections of, activities and studies of types specified in section 31 and of activities under licenses issued pursuant to section 53, 63, 81, 103, and 104, as may be necessary to effectuate the purposes of this Act, including section 105; and

p. make, promulgate, issue, rescind, and amend such rules and regulations as may be necessary to carry out the purposes of this Act.

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CHAPTER XV. JUDICIAL REVIEW AND ADMINISTRATIVE PROCEDURE

SEC. 181. GENERAL.—The provisions of the Administrative Procedure Act (Public Law 404, Seventy-ninth Congress, approved June 11, 1946) shall apply to all agency action taken under this Act, and the terms "agency" and "agency action" shall have the meaning specified in the Administrative Procedure Act: *Provided, however,* That in the case of agency proceedings or actions which involve Restricted Data or defense information, the Commission shall provide by regulation for such parallel procedures as will effectively safeguard and prevent disclosure of Restricted Data or defense information to unauthorized persons with minimum impairment of the procedural rights which would be available if Restricted Data or defense information were not involved.

SEC. 182. LICENSE APPLICATIONS.—

a. Each application for a license hereunder shall be in writing and shall specifically state such information as the Commission, by rule or regulation, may determine to be necessary to decide such of the technical and financial qualifications of the applicant, the character of the applicant, the citizenship of the applicant, or any other qualifications of the applicant as the Commission may deem appropriate for the license. In connection with applications for licenses to operate production or utilization facilities, the applicant shall state such technical specifications, including information of the amount, kind, and source of special nuclear material required, the place of the use, the specific characteristics of the facility, and such other information as the Commission may, by rule or regulation, deem necessary in order to enable it to find that the utilization or production of special nuclear material will be in accord with the common defense and security and will provide adequate protection to the health and safety of the public. Such technical specifications shall be a part of any license issued. The Commission may at any time after the filing of the original application, and before the expiration of the license, require further written statements in order to enable the Commission to determine whether the application should be granted or denied or whether a license should be modified or revoked. All applications and statements shall be signed by the applicant or licensee. Applications for, and statements made in connection with, licenses under sections 103 and 104 shall be made under oath or affirmation. The Commission may require any other applications or statements to be made under oath or affirmation.

b. The Advisory Committee on Reactor Safeguards shall review each application under section 103 or section 104 b. for a construction permit or an operating license for a facility, any application under section 104 c. for a

construction permit or an operating license for a testing facility, any application under section 104 a. or c. specifically referred to it by the Commission, and any application for an amendment to a construction permit or an amendment to an operating license under section 103 or 104 a., b., or c. specifically referred to it by the Commission, and shall submit a report thereon which shall be made part of the record of the application and available to the public except to the extent that security classification prevents disclosure.

c. The Commission shall not issue any license under section 103 for a utilization or production facility for the generation of commercial power until it has given notice in writing to such regulatory agency as may have jurisdiction over the rates and services incident to the proposed activity; until it has published notice of the application in such trade or news publications as the Commission deems appropriate to give reasonable notice to municipalities, private utilities, public bodies, and cooperatives which might have a potential interest in such utilization or production facility; and until it has published notice of such application once each week for four consecutive weeks in the Federal Register, and until four weeks after the last notice.

d. The Commission, in issuing any license for a utilization or production facility for the generation of commercial power under section 103, shall give preferred consideration to applications for such facilities which will be located in high cost power areas in the United States if there are conflicting applications for a limited opportunity for such license. Where such conflicting applications resulting from limited opportunity for such license include those submitted by public or cooperative bodies such applications shall be given preferred consideration.

Sec. 183. Terms of Licenses.—Each license shall be in such form and contain such terms and conditions as the

Commission may, by rule or regulation, prescribe to effectuate the provisions of the Act, including the following provisions:

b. No right to the special nuclear material shall be conferred by the license except as defined by the license.

c. Neither the license nor any right under the license shall be assigned or otherwise transferred in violation of the provisions of this Act.

d. Every license issued under this Act shall be subject to the right of recapture or control reserved by section 108, and to all of the other provisions of this Act, now or hereafter in effect and to all valid rules and regulations of the Commission.

Sec. 184. Inalienability of Licenses. — No license granted hereunder and no right to utilize or produce special nuclear material granted hereby shall be transferred, assigned or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person, unless the Commission shall, after securing full information, find that the transfer is in accordance with the provisions of this Act, and shall give its consent in writing. The Commission may give such consent to the creation of a mortgage, pledge, or other lien upon any facility or special nuclear material, owned or thereafter acquired by a licensee, or upon any leasehold or other interest in such facility, and the rights of the creditors so secured may thereafter be enforced by any court subject to rules and regulations established by the Commission to protect public health and safety and promote the common defense and security.

Sec. 185. Construction Permits.—All applicants for licenses to construct or modify production or utilization facilities shall, if the application is otherwise acceptable to the Commission, be initially granted a construction permit. The construction permit shall state the earliest and

latest dates for the completion of the construction or modification. Unless the construction or modification of the facility is completed by the completion date, the construction permit shall expire, and all rights thereunder be forfeited, unless upon good cause shown, the Commission extends the completion date. Upon the completion of the construction or modification of the facility, upon the filing of any additional information needed to bring the original application up to date, and upon finding that the facility authorized has been constructed and will operate in conformity with the application as amended and in conformity with the provisions of this Act and of the rules and regulations of the Commission, and in the absence of any good cause being shown to the Commission why the granting of a license would not be in accordance with the provisions of this Act, the Commission shall thereupon issue a license to the applicant. For all other purposes of this Act, a construction permit is deemed to be a "license".

SEC. 186. REVOCATION.—

a. Any license may be revoked for any material false statement in the application or any statement of fact required under section 182, or because of conditions revealed by such application or statement of fact or any report, record, or inspection or other means which would warrant the Commission to refuse to grant a license on an original application, or for failure to construct or operate a facility in accordance with the terms of the construction permit or license or the technical specifications in the application, or for violation of, or failure to observe any of the terms and provisions of this Act or of any regulation of the Commission.

b. The Commission shall follow the provisions of section 9(b) of the Administrative Procedure Act in revoking any license.

c. Upon revocation of the license, the Commission may immediately retake possession of all special nuclear material held by the licensee. In cases found by the Commission to be of extreme importance to the national defense and security or to the health and safety of the public, the Commission may recapture any special nuclear material held by the licensee or may enter upon and operate the facility prior to any of the procedures provided under the Administrative Procedure Act. Just compensation shall be paid for the use of the facility.

SEC. 187. MODIFICATION OF LICENSE.—The terms and conditions of all licenses shall be subject to amendment, revision, or modification, by reason of amendments of this Act, or by reason of rules and regulations issued in accordance with the terms of this Act.

SEC. 188. CONTINUED OPERATION OF FACILITIES.—Whenever the Commission finds that the public convenience and necessity or the production program of the Commission requires continued operation of a production facility or utilization facility the license for which has been revoked pursuant to section 186, the Commission may, after consultation with the appropriate regulatory agency, State or Federal, having jurisdiction, order that possession be taken of and such facility be operated for such period of time as the public convenience and necessity or the production of the Commission may, in the judgment of the Commission, require, or until a license for the operation of the facility shall become effective. Just compensation shall be paid for the use of the facility.

SEC. 189. HEARINGS AND JUDICIAL REVIEW.—

a. In any proceeding under this Act, for the granting, suspending, revoking, or amending of any license or construction permit, or application to transfer control, and in any proceeding for the issuance or modification of rules

and regulations dealing with the activities of licensees, and in any proceeding for the payment of compensation, an award, or royalties under sections 153, 157, 186 c., or 188, the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding. The Commission shall hold a hearing after thirty days' notice and publication once in the Federal Register, on each application under section 103 or 104 b. for a construction permit for a facility, and on any application under section 104 c. for a construction permit for a testing facility. In cases where such a construction permit has been issued following the holding of such a hearing, the Commission may, in the absence of a request therefor by any person whose interest may be affected, issue an operating license or an amendment to a construction permit or an amendment to an operating license without a hearing, but upon thirty days' notice and publication once in the Federal Register of its intent to do so. The Commission may dispense with such thirty days' notice and publication with respect to any application for an amendment to a construction permit or an amendment to an operating license upon a determination by the Commission that the amendment involves no significant hazards consideration.

b. Any final order entered in any proceeding of the kind specified in subsection a. above shall be subject to judicial review in the manner prescribed in the Act of December 29, 1950, as amended (ch. 1189, 64 Stat. 1129), and to the provisions of section 10 of the Administrative Procedure Act, as amended.

Sec. 190. Licensee Incident Reports.—No report by any licensee of any incident arising out of or in connection with a licensed activity made pursuant to any requirement of the Commission shall be admitted as evidence in any suit or action for damages growing out of any matter mentioned in such report.

Sec. 191. Atomic Safety and Licensing Board.—

a. Notwithstanding the provisions of sections 7(a) and 8(a) of the Administrative Procedure Act, the Commission is authorized to establish one or more atomic safety and licensing boards, each comprised of three members, one of whom shall be qualified in the conduct of administrative proceedings and two of whom shall have such technical or other qualifications as the Commission deems appropriate to the issues to be decided, to conduct such hearings as the Commission may direct and make such intermediate or final decisions as the Commission may authorize with respect to the granting, suspending, revoking or amending of any license or authorization under the provisions of this Act, any other provision of law, or any regulation of the Commission issued thereunder. The Commission may delegate to a board such other regulatory functions as the Commission deems appropriate. The Commission may appoint a panel of qualified persons from which board members may be selected.

b. Board members may be appointed by the Commission from private life, or designated from the staff of the Commission or other Federal agency. Board members appointed from private life shall receive a per diem compensation for each day spent in meetings or conferences, and all members shall receive their necessary traveling or other expenses while engaged in the work of a board. The provisions of section 163 shall be applicable to board members appointed from private life.

Sec. 192. Temporary Operating License.—

a. In any proceeding upon an application for an operating license for a nuclear power reactor, in which a hearing is otherwise required pursuant to section 189 a., the applicant may petition the Commission for a temporary operat-

ing license authorizing operation of the facility pending final action by the Commission on the application. Such petition may be filed at any time after filing of: (1) the report of the Advisory Committee on Reactor Safeguards required by subsection 182 b.; (2) the safety evaluation of the application by the Commission's regulatory staff; and (3) the regulatory staff's final detailed statement on the environmental impact of the facility prepared pursuant to section 102(2) (C) of the National Environmental Policy Act of 1969 (83 Stat. 853) or, in the case of an application for operating license filed on or before September 9, 1971, if the regulatory staff's final detailed statement required under section 102(2) (C) is not completed, the Commission must satisfy the applicable requirements of the National Environmental Policy Act prior to issuing any temporary operating license under this section 192. The petition shall be accompanied by an affidavit or affidavits setting forth the facts upon which the petitioner relies to justify issuance of the temporary operating license. Any party to the proceeding may file affidavits in support of, or opposition to, the petition within fourteen days after the filing of such petition, or within such additional time not to exceed ten days as may be fixed by the Commission. The Commission shall hold a hearing after ten days' notice and publication once in the Federal Register on any such petition and supporting material filed under this section and the decision of the Commission with respect to the issuance of a temporary operating license following such hearing, shall be on the basis of findings on the matters specified in subsection b. of this section. The hearing required by this section and the decision of the Commission on the petition shall be conducted with expedited procedures as the Commission may by rule, regulation, or order deem appropriate for a full disclosure of material facts on all substantial issues raised in connection with the proposed temporary operating license.

b. With respect to any petition filed pursuant to subsection a. of this section, the Commission shall issue a temporary operating license upon finding that:

(1) the provisions of section 185 have been met with respect to the temporary operating license;

(2) operation of the facility during the period of the temporary operating license in accordance with its terms and conditions will provide adequate protection of the environment during the period of the temporary operating license; and

(3) operation of the facility in accordance with the terms and conditions of the temporary operating license is essential toward insuring that the power generating capacity of a utility system or power pool is at, or is restored to, the levels required to assure the adequacy and reliability of the power supply, taking into consideration factors which include, but need not be limited to, alternative available sources of supply, historical reserve requirements for the systems involved to function reliably, the possible endangerment to the public health and safety in the event of power shortages, and data from appropriate Federal and State governmental bodies which have official responsibility to assure an adequate and reliable power supply. The temporary license shall contain such terms and conditions as the Commission may deem necessary, including the duration of the license and any provision for the extension thereof, and the requirement that the licensee not retire or dismantle any of its existing generating capacity on the ground of the availability of the capacity from the facility which is operating under the temporary license. Any decision or other document authorizing the issuance of any temporary license pursuant to this section shall recite with specificity the reasons justifying the issuance. The decision of the Commission with respect to the issuance of a temporary operating license shall be subject to judicial

review pursuant to the Act of December 29, 1950, as amended (ch. 1189, 64 Stat. 1129).

c. The hearing on the application for the final operating license otherwise required pursuant to section 189 a. shall be concluded as promptly as practicable. The Commission shall vacate the temporary operating license if it finds that the applicant is not prosecuting the application for the final operating license with due diligence. Issuance of a temporary operating license pursuant to subsection b. of this section shall be without prejudice to the position of any party to the proceeding in which a hearing is otherwise required pursuant to section 189 a.: and failure to assert any ground for denial or limitation of a temporary operating license shall not bar the assertion of such ground in connection with the issuance of a subsequent final operating license.

d. The authority under this section shall expire on October 30, 1973.

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RELEVANT SECTIONS OF ENERGY REORGANIZATION ACT OF 1974, PUB. L. 93-438, CH. 73, 88 STAT. 1233, AS AMENDED, 42 U.S.C. §§ 5801 ET. SEQ.

AN ACT

To reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration and in a new Nuclear Regulatory Commission in order to promote more efficient management of such functions.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

SECTION 1. This Act may be cited as the "Energy Reorganization Act of 1974".

DECLARATION OF PURPOSE

SEC. 2. (2) The Congress hereby declares that the general welfare and the common defense and security require effective action to develop, and increase the efficiency and reliability of use of, all energy sources to meet the needs of present and future generations, to increase the productivity of the national economy and strengthen its position in regard to international trade, to make the Nation self-sufficient in energy, to advance the goals of restoring, protecting, and enhancing environmental quality, and to assure public health and safety.

(b) The Congress finds that, to best achieve these objectives, improve Government operations, and assure the coordinated and effective development of all energy sources, it is necessary to establish an Energy Research and Development Administration to bring together and direct Federal activities relating to research and development on the various sources of energy, to increase the efficiency

and reliability in the use of energy, and to carry out the performance of other functions, including but not limited to the Atomic Energy Commission's military and production activities and its general basic research activities. In establishing an Energy Research and Development Administration to achieve these objectives, the Congress intends that all possible sources of energy be developed consistent with warranted priorities.

(c) The Congress finds that it is in the public interest that the licensing and related regulatory functions of the Atomic Energy Commission be separated from the performance of the other functions of the Commission, and that this separation be effected in an orderly manner, pursuant to this Act, assuring adequacy of technical and other resources necessary for the performance of each.

(d) The Congress declares that it is in the public interest and the policy of Congress that small business concerns be given a reasonable opportunity to participate, insofar as is possible, fairly and equitably in grants, contracts, purchases, and other Federal activities relating to research, development, and demonstration of sources of energy efficiency, and utilization and conservation of energy. In carrying out this policy, to the extent practicable, the Administrator shall consult with the Administrator of the Small Business Administration.

(e) Determination of priorities which are warranted should be based on such considerations as power-related values of an energy source, preservation of material resources, reduction of pollutants, export market potential (including reduction of imports), among others. On such a basis, energy sources warranting priority might include, but not be limited to, the various methods of utilizing solar energy.

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TITLE II—NUCLEAR REGULATORY COMMISSION

ESTABLISHMENT AND TRANSFERS

SEC. 201. (a) There is established an independent regulatory commission to be known as the Nuclear Regulatory Commission which shall be composed of five members, each of whom shall be a citizen of the United States. The President shall designate one member of the Commission as Chairman thereof to serve as such during the pleasure of the President. The Chairman may from time to time designate any other member of the Commission as Acting Chairman during his absence. The Chairman (or the Acting Chairman in the absence of the Chairman) shall preside at all meetings of the Commission and a quorum for the transaction of business shall consist of at least three members present. Each member of the Commission, including the Chairman, shall have equal responsibility and authority in all decisions and actions of the Commission, shall have full access to all information relating to the performance of his duties or responsibilities, and shall have one vote. Action of the Commission shall be determined by a majority vote of the members present. The Chairman (or Acting Chairman in the absence of the Chairman) shall be the official spokesman of the Commission in its relations with the Congress, Government agencies, persons, or the public, and, on behalf of the Commission, shall see to the faithful execution of the policies and decisions of the Commission, and shall report thereon to the Commission from time to time as the Commission may direct. The Commission shall have an official seal which shall be judicially noticed.

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LICENSING AND RELATED REGULATORY FUNCTIONS RESPECTING SELECTED ADMINISTRATION FACILITIES

SEC. 202. Notwithstanding the exclusions provided for in section 110 a. or any other provisions of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2140(a)), the Nuclear Regulatory Commission shall, except as otherwise specifically provided by section 110 b. of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2140(b)), or other law, have licensing and related regulatory authority pursuant to chapters 6, 7, 8, and 10 of the Atomic Energy Act of 1954, as amended, as to the following facilities of the Administration:

(1) Demonstration Liquid Metal Fast Breeder reactors when operated as part of the power generation facilities of an electric utility system, or when operated in any other manner for the purpose of demonstrating the suitability for commercial application of such a reactor.

(2) Other demonstration nuclear reactors—except those in existence on the effective date of this Act—when operated as part of the power generation facilities of any electric utility system, or when operated in any other manner for the purpose of demonstrating the suitability for commercial application of such a reactor.

(3) Facilities used primarily for the receipt and storage of high-level radioactive wastes resulting from activities licensed under such Act.

(4) Retrievable Surface Storage Facilities and other facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the Administration, which are not used for, or are part of, research and development activities.

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RELEVANT SECTION OF NATIONAL ENVIRONMENTAL POLICY ACT OF 1969, PUB. L. 91-190, 83 STAT. 852, AS AMENDED, 42 U.S.C. § 4332

SECTION 102. The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall—

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review processes;

(D) Any detailed statement required under subparagraph (C) after January 1, 1970, for any major Federal action funded under a program of grants to States shall not be deemed to be legally insufficient solely by reason of having been prepared by a State agency or official, if:

(i) the State agency or official has statewide jurisdiction and has the responsibility for such action,

(ii) the responsible Federal official furnishes guidance and participates in such preparation,

(iii) the responsible Federal official independently evaluates such statement prior to its approval and adoption, and

(iv) after January 1, 1976, the responsible Federal official provides early notification to, and solicits the views of, any other State or any Federal land management entity of any action or any alternative thereto which may have significant im-

pacts upon such State or Federal land management entity and, if there is any disagreement on such impacts, prepares a written assessment of such impacts and views for incorporation into such detailed statement.

The procedures in this subparagraph shall not relieve the Federal official of his responsibilities for the scope, objectivity, and content of the entire statement or of any other responsibility under this Act; and further, this subparagraph does not affect the legal sufficiency of statements prepared by State agencies with less than statewide jurisdictions.

(E) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(F) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(G) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(H) initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(I) assist the Council on Environmental Quality established by title II of this Act.

FEDERAL REGISTER, VOL. 41, No. 159—
MONDAY, AUGUST 16, 1976

[Docket RM-50-3]

Environmental Effects of the Uranium Fuel Cycle

General Statement of Policy

Two recent decisions by the United States Court of Appeals for the District of Columbia Circuit raise significant questions regarding the future course of Commission licensing activities over the coming months. The decisions are *Natural Resources Defense Council, et al.* v. *NRC*, Nos. 74-1385 and 74-1586; and *Aeschliman, et al.* v. *NRC*, Nos. 73-1776 and 73-1867 (July 21, 1976). The purpose of this policy statement is to indicate how the Commission intends to conduct its licensing activities pending resolution of the several legal questions raised by the decisions. This statement is not intended to resolve, or indicate any resolution of, the question whether the particular licenses before the court in these cases are to be continued, modified, or suspended during the proceedings called for; since the court refused an explicit request to set aside these licenses, the Commission's view is that the court expects it to resolve this question in formal proceedings, in light of the facts and the applicable law. Nor is this statement intended to reflect any position the Commission may take in further litigation in these cases.

As this statement was in the final stages of preparation, the Commission received a proposal for rulemaking from the Natural Resources Defense Council concerning many of the issues discussed herein. Comments on that proposal are solicited in a coordinate Federal Register notice, also published today. Initial consideration of the petition indicates that it varies in several respects from this policy statement. Some of these variations (notably, rules proposed for existing construction permits, LWA's and operating licenses) may reflect differing legal interpretations; however, in general, publication of the present policy statement will not irretrievably commit the Commission or others to a course inconsistent with the proposals made. The Commission believes that the need for immediate guidance to its staff and licensing boards, and to the interested public, requires publication of the present statement. The Commission will carefully consider the suggestions of the NRDC and, indeed, is aware that others should have the opportunity to comment on these proposals and to offer suggestions for implementing the recent court of appeals decisions.

While other questions were decided, the principal impact of the court's opinions on Commission actions arises from holdings on three related points:

1. A rule adopted by the former AEC in 1974 to codify the environmental effects of the uranium fuel cycle for individual light-water nuclear power reactors, 10 CFR 51.20(e), was inadequately supported insofar as it treated the reprocessing of spent fuel and of radioactive wastes;

2. The National Environmental Policy Act of 1969 requires analysis of these reprocessing and waste issues, either through rulemaking or in individual licensing proceedings, as a prerequisite to Commission licensing of a nuclear power plant;

3. If the Commission wishes to revise its rule, it must do so by procedures more demanding than the notice-and-comment procedures required for informal rulemaking by the Administrative Procedure Act. (The court divided 2-1 on the question of further procedures, Judge Tamm stating that notice-and-comment procedures would suffice.)

Even though review of one or more of these rulings may be sought, prudent and responsible regulation requires immediate steps to further analyze the reprocessing and waste disposal issues. Accordingly, the Commission's staff has been directed to review the existing literature thoroughly

and to produce on an expedited basis a revised and adequately documented environmental survey on the probable contribution to the environmental costs of licensing a nuclear power reactor that is attributable to the reprocessing and waste management stages of the uranium fuel cycle. It is expected that this statement will be ready on or about September 30, 1976.

The Commission intends to reopen the rulemaking proceeding on the Environmental Effects of the Uranium Fuel Cycle, Docket RM-50-3 for the limited purposes of:

1. Supplementing the record on the reprocessing and waste management issues; and

2. Determining whether or not on the basis of the supplemented record, Table S-3 of 10 CFR 51.20(d) should be amended and, if so, in what respect.

The revised environmental survey just described, together with any amendments to Table S-3 that may be proposed as a consequence of that analysis, will be the basis for these reopened proceedings. We understand the court to regard the procedures originally used as capable of fully ventilating the issues involved, permitting a reasoned Commission discussion and producing a valid rule.[1] These procedures, which included an oral hearing and questioning of witnesses by the presiding panel, are set forth at 38 Fed.

[1] The court understood, as do we, that any such rule would be but one step in national planning for radioactive waste management. The Energy Research and Development Administration has undertaken a comprehensive environmental impact statement, now scheduled for issuance in draft form in April, 1977. A variety of other measures, including this agency's development of goals, objectives, and general environmental criteria for waste management, are also under way. As the Commission then proceeds to develop its regulatory framework for waste management, appropriate environmental impact statements will be prepared. Obviously, areas of uncertainty which may be developed by the present study will help to shape these efforts.

Reg. 50, January 30, 1973. Alternative procedures, modeled on those to be employed by the Commission in its forthcoming GESMO hearings, have been suggested by the National Resources Defense Council in the petition for rulemaking referenced above. An election of procedures to be followed will be made in a forthcoming notice of hearing, following the comment period on that petition, which closes August 31, 1976.

While the extended rulemaking is in progress, the Commission and its licensing boards will be called upon to decide whether nuclear reactor licenses can issue, and whether previously granted licenses should be suspended, modified, or set aside.

In view of the court's recent decisions, the Commission has concluded that no new full-power operating license, construction permit or limited work authorization should be issued pending the developments to be described below. This conclusion is based on recognition that the grant of each of those authorizations, permits, or licenses is premised upon the completion of an adequate environmental impact statement, and that under the subject decisions, absent an acceptable substitute for those portions of Table S-3 which the court has found inadequately supported, the basis for a complete environmental impact statement will not be in place.

The Commission recognizes that this conclusion may have significant impacts on the availability and costs of nuclear power facilities. At present, two nuclear power plants are at the stage where an operating license might otherwise have been issued immediately; two plants will reach that stage within the next four months. Additionally, a decision on whether to issue construction permits for five power plants would in all probability have been reached by the end of the year. The number of plants affected by a cessation of licensing grows with time, and there are obvious cepts for reprocessing and waste technology do not vary

significantly with the design of nuclear power generating facilities, it is extremely unlikely that the revised environmental survey will result in any modification of these facilities. Only the possibility of discontinuing their construction or use is likely to be at issue.

The Commission does not believe that the licensing constraints here announced must necessarily continue until a rulemaking employing oral hearing procedures has been completed, a process which could take fully a year. If the revised environmental survey justifies, notice and comment rulemaking can provide the basis for an interim rule which would be an adequate substitute for Table S-3 pending issuance of the final rule. In addition to the revised environmental survey, the basis for such an interim rule would include an evaluation of the environmental impact of using that interim rule as a basis for licensing until the final rule is in place, and an assessment of the impact of a suspension of further licensing during that time period. The Commission has directed its staff to develop this information by September 30, 1976. Since interim rulemaking would be accomplished through notice and comment procedures only, an interim rule might be promulgated as early as December 1976, providing a basis for licensing at that time.

The Commission also has under consideration the possibility of a future request to the court of appeals for a stay of its mandate, such a request to be explicitly supported by an appraisal of the likely impact of the court's decision and of granting the stay. If granted, a stay so supported might also provide the basis for resumed licensing.

Finally, some Commission licensing actions do not require preparation of an environmental impact statement, depending upon the circumstances. See 10 CFR 51.5(b). In these instances, which may include authorizations for fuel loading, low-power testing, or amending a construction

permit, the Commission's regulations require that an environmental impact appraisal be undertaken in order to determine whether an environmental impact statement must be prepared. 10 CFR 51.5(c). The absence of an effective Table S-3 would not preclude licensing that is not dependent upon an environmental impact statement. Consequently the Commission is instructing its staff and licensing boards that they may continue to take such actions where an environmental impact assessment has been made and has resulted in a determination that no environmental impact statement need be prepared. See 10 CFR 51.5, 51.7.

In all other instances, the staff and the licensing boards shall continue to process applications and hold hearings up to the point of, but not including, licensing. However, in any contested proceeding, reprocessing and waste management issues should be deferred pending completion of the interim rulemaking, unless the evidentiary record on those issues has already been completed and is adequate for decision. The Commission wishes to avoid the needless duplication which proceeding both by rulemaking and in individual contested licensing hearings would entail and the overall delay that would result. Where a proceeding is uncontested, licensing shall nevertheless be deferred until the Commission has published the revised environmental survey, documenting the probable contribution to the environmental costs of licensing a nuclear power reactor which is attributable to the reprocessing and waste management stages of the uranium fuel cycle. These values may then be used in reaching a NEPA cost/benefit assessment prerequisite to licensing. Similarly, where a license has been issued, but the action has not become final within the Commission because of pending appeal or possible Commission review, final action or review should be deferred pending publication of the environmental survey; other issues, including as appropriate the issue of suspending activity under the license question, may be resolved in the interim.

With regard to the Vermont Yankee and Midland licenses at issue in the two court of appeals cases, we agree with the view expressed by the Commission's staff that questions of modification or suspension should be resolved in formal proceedings in light of the facts and the applicable law. Since we have decided that reprocessing and waste management issues should be treated generically by rulemaking rather than on a case-by-case basis, the initial question on remand of the Vermont Yankee and Midland orders will be whether the licenses should be continued, modified, or suspended until an interim rule has been made effective. In resolving this question, the Commission intends to assign the matter to licensing boards with instructions to call for briefs from the parties followed by evidentiary hearings if necessary.[2] The same question would arise on a request for a show cause order seeking the suspension or modification on fuel cycle rule grounds of any other nuclear power plant license.

It is the Commission's understanding that resolution of this question turns on equitable factors well established in prior practice and case law. Such factors include whether it is likely that significant adverse impact will occur until a new interim fuel cycle rule is in place; whether reasonable alternatives will be foreclosed by continued construction or operation; the effect of delay; and the possibility that the cost/benefit balance will be tilted through increased investment. See *Coalition for Safe Nuclear Power* v. *AEC*, 463 F.2d 954 (D.C. Cir. 1972); San Onofre, Units 2 and 3, 7 AEC 986, 996-97 (June 1974). General public policy concerns, the need for the project, the extent of the NEPA violation, and the timeliness of objections are also among the pertinent considerations. See, e.g., *Conservation Society of Southern Vermont Inc.* v. *Secretary of Transportation*, 403

[2] An evidentiary hearing on other issues will be required in Midland, barring further review. That hearing, however, should not be commenced until the Midland decision has become final.

F.2d 927, 933-934 (2d Cir. 1974), vacated on other grounds and remanded, 423 U.S. 809 (1975); *Greene County Planning Board* v. *FPC*, 455 F.2d 412, 414-425 (2d Cir.), cert. denied, 409 U.S. 849 (1972); *City of New York* v. *United States*, 337 F. Supp. 150, 163 (E.D.N.Y.) (three-judge court).[3]

[3] In its petition for rulemaking, noticed today, the Natural Resources Defense Council suggests that the appropriate course for the interim period concerning facilities which hold effective licenses should be as follows:

Facilities which received operating licenses before July 21, 1976. NRC will order suspension of the operating license for any such facilities unless the licensee can establish that:

(1) Continued operation of the plant essential to maintain a reliable supply of energy to the reliability region of which the plant is a part, taking into account alternative available sources of supply (including purchase power), historical reserve requirements, and available interconnections for transmitting power;

(2) Continued operation of the facility will provide adequate protection for the public health and safety, taking into account the health and safety problems associated with production, storage, transportation, reprocessing, if any, and management or disposal of all nuclear fuel required for the plant and all nuclear wastes produced by the plant;

(3) Continued operation of the facility will not tend to foreclose, now or in the future, implementation of alternatives to the operation of this facility or to the design, construction or operation of other facilities which may be considered following completion of the review required by 10 CFR Section—; and

(4) Continued operation of the facility will not tend to irretrievably commit resources to the production of nuclear fuel or the storage, reprocessing, if any, management or disposal of any nuclear wastes.

Facilities which received construction permits or LWA's prior to July 21, 1976. NRC will order suspension of the LWA or the construction permit unless the license can establish that:

(1) Continued construction of the plant is essential to maintain a reliable supply of energy to the reliability region of which the plant is a part, taking into account alternative available sources of

Finally, even if no request for suspension of modification of an LWA, CP, or OL is received, the Commission will nevertheless determine whether it should sua sponte initiate show cause proceedings based upon information the Commission receives in the revised environmental survey. As noted earlier, this information should be in hand by September 30. The Commission's determination whether or not to reopen all licenses will then be issued.

Dated at Washington, D.C. this 13th day of August 1976.

For the Nuclear Regulatory Commission.

SAMUEL J. CHILK,
Secretary of the Commission.

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supply (including purchase power), historical reserve requirements and available interconnections for transmitting power;

(2) Continued construction will not tend to foreclose, now or in the future, implementation of alternatives to the design, construction or operation of this or other facilities which alternatives may be considered following completion of the review required by 10 CFR—; and

(3) Continued construction will not tend to irretrievably commit resources to the facility.

As noted in the text imediately following this note, we believe the appropriate time for NRC consideration of sua sponte, across-the-board initiation of show cause proceedings to be when it has received from its staff its revised and documented assessment of the reprocessing and waste management issues. While the issues of reprocessing and waste management fully warrant serious and timely attention, no information now at hand calls for so drastic a step in the brief period before this analysis will be available. Also, while the individual factors NRDC suggests are among those relevant to be addressed in seeking a show cause order or in any show cause proceeding, the Commission cannot accept the suggestion that these factors are cumulative and must be satisfied; its own approved prior practice and established judicial precedent permit balancing of these factors to determine where the equities of each particular case lie.

In adopting this approach, one inconsistent with the NRDC petition, the Commission is aware that neither NRDC nor other concerned parties have been formally heard. In commenting on the NRDC petition, any party interested to do so (including NRDC) may file comments addressed to the point.

FEDERAL REGISTER, VOL. 41, NO. 202,
MONDAY, OCTOBER 18, 1976

NUCLEAR REGULATORY COMMISSION

[10 CFR Part 51]

LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Uranium Fuel Cycle Impacts From Spent Fuel Reprocessing and Radioactive Waste Management

Pursuant to the National Environmental Policy Act of 1969 (NEPA), an environmental impact statement is prepared by the Commission in connection with issuance of a construction permit or operating license for each light water nuclear power reactor. These statements contain a detailed evaluation of the environmental impacts of construction and operation of the plant and a discussion of reasonable alternatives, as well as an overall assessment of the costs and benefits of the licensing action.

In November 1972, a document entitled "Environmental Survey of the Nuclear Fuel Cycle" was published by the Directorate of Licensing of the Atomic Energy Commission (AEC). The purpose of that document was to establish a technical basis for informed consideration of environmental effects of the uranium fuel cycle in the environmental impact statements for individual light water power reactors (LWR's). In the Survey the nuclear fuel cycle was treated generically. This permitted an overview of the entire industry without the need to evaluate particular plants. To compensate for the consequent lack of specific site and design detail, estimates were made of effluent concentration, radiation dose rates, and human population densities appropriate to the model fuel-cycle facilities. This approach was necessary because it was not possible to trace the fresh and spent fuel for an individual reactor back or forward through the fuel cycle and thereby pin-

point environmental impacts at specific plants at specific points in time.

Comments on the Environmental Survey were solicited, and an informal rulemaking hearing was held on February 1 and 2, 1973. The purpose of the hearing was to consider possible amendments of Appendix D of 10 CFR Part 50 which would, by rule, specify the environmental effects of the uranium fuel cycle to be factored into the assessment of costs and benefits in environmental impact statements for individual LWR's. Written comments were received in response to the FEDERAL REGISTER notice, and recommendations for improvement were offered during the hearings. After consideration of the written comments and the hearing record, the AEC promulgated the final fuel cycle rule (so-called Table S-3) on April 22, 1974 (39 FR 14188). It was intended that, with the inclusion of environmental impacts from Table S-3, the environmental impact statements for individual LWR's would represent a full and candid assessment of costs and benefits consistent with the legal requirements and spirit of NEPA. The AEC indicated in its decision that the rule and survey would be reexamined from time to time to accommodate new information.[1]

The same Table S-3 is now included in 10 CFR Part 51.

On January 19, 1975, the Atomic Energy Commission was abolished and its licensing and regulatory responsibilities transferred to the Nuclear Regulatory Commission (Commission). On July 21, 1976, the United States Court of Appeals for the District of Columbia Circuit decided "*Natural Resources Defense Council* v. *NRC*," a case involving judicial review of the fuel-cycle rule, and "*Aeschli-*

[1] In this regard, the Nuclear Regulatory Commission Staff is initiating a study designed to examine information that has developed since promulgation of the fuel cycle rule in 1974 for the purpose of updating the rule in areas other than waste management and reprocessing.

man v. *NRC*," a related case involving the exclusion of fuel cycle issues from an individual power reactor licensing proceeding. The Court approved the overall approach and methodology of the fuel cycle rule. It found that, "[r]egarding most phases of the fuel cycle * * * the underlying Environmental Survey represented an adequate, even admirable job, of describing the processes involved." The Court noted that the survey assembled data on consumption of resources, discussed the risks of accidents and other hazards in detail, and provided numerous references to the scholarly literature and technical reports in support of the conclusions as to environmental impact. However, the Court found that the rule was inadequately supported by the record insofar as it treated two particular aspects of the fuel cycle—the impacts from reprocessing of spent fuel and the impacts from radioactive waste management.

The Commission issued a General Statement of Policy (41 FR 34707, August 16, 1976) in response to the decisions. In that statement, the Commission announced its intention to reopen the rulemaking proceeding on the environmental effects of the fuel cycle to supplement the existing record on waste management and reprocessing impacts and to determine whether the rule should be amended, and, if so, in what respect. The Commission directed the Staff to prepare on an expedited basis a well-documented supplement to the survey to establish a basis for identifying environmental impacts associated with fuel reprocessing and waste management activities that are attributable to the licensing of a model light-water reactor.

The revised survey, "Environmenal Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0116 (Supplement 1 to WASH-1248), (hereinafter referred to as "supplement"), has now been completed and copies are available for public inspection at the Commission's Public Document Room at 1717 H St., N.W., Washington, D.C. 20555.

In the original fuel cycle rule the environmental impacts for the fuel cycle activities necessary for the support of a LWR were summarized in a Table S-3. These effects were also displayed by type of activity in Table S-3A of WASH-1248, April 1974. In the supplement, only the environmental impacts that would fall under the columns entitled "Reprocessing" (Column F) and "Waste Management" (Column G) of Table S-3A of WASH-1248 (and related transportation—part of Column H) are addressed, consistent with the Court decisions and the Commission's General Statement of Policy. The Table set forth below shows proposed revisions to Table S-3 in light of the supplement. The format of Table S-3A is followed in order to show the separate impacts from reprocessing and waste management. Both the old and new impact values are included to facilitate review. Any final interim rule will revert back to the Table S-3 format.

"Waste management," as that term was used in the fuel cycle rule and is used in this notice of proposed rulemaking, refers to the handling of wastes from post-fission operations in the fuel cycle, or other operations from which wastes arise and are shipped to some storage or burial facility. In the fuel cycle rule wastes disposed of at the sites of their generation (e.g., tailings from mills) were included in the impacts from those operations (i.e., in the other appropriate columns of Table S-3A). These wastes are mentioned in the supplement in the description of the fuel cycle, but since these aspects of the original survey were upheld by the Court, they are not addressed here.

A complete understanding of the management of nuclear wastes requires a discussion of the operations through which wastes pass from the place and time of their generation to their disposal. Therefore, the supplement discusses the operations at each plant in which the wastes are treated, stored, and prepared for shipment to offsite storage or

disposal facilities. The supplement also deals with the transportation of these wastes.

In a reprocessing plant, the highly radioactive spent-fuel elements are chopped into short segments, the fuel is dissolved by strong acid, and the resultant solution is separated chemically to give (1) uranium in solution, (2) plutonium in solution, and (3) fission products and unwanted actinides in the waste stream. In this process, a number of other materials become contaminated and emerge as wastes of lesser radioactivity. All of these materials are made into a form suitable for shipment to the next step in the fuel cycle or to disposal. The impacts of all these processes are addressed in the supplement.

In the recently issued report "Final Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors," NUREG-0002 (hereafter referred to as GESMO), five alternative fuel cycle options were evaluated, and three were reviewed in detail: no recycle, uranium-only recycle, and uranium and plutonium recycle. The fuel cycle rule, Table S-3, had as its base a modification of the uranium-only recycle process in which separated plutonium was stored for possible later use, rather than being recycled or treated as a waste stream as in GESMO. This supplement considers the no-recycle fuel option in addition to the uranium-only recycle option. For the latter, plutonium is treated as a waste. The uranium-plutonium recycle option is treated in detail in GESMO and is beyond the scope of this proceeding. The individual entries in the revised Table which follows are maximized in that they are based on the uranium-only recycle process, or no-recycle, whichever produced the greater impacts.

In the supplement the model fuel-cycle facilities, in terms of capacities, waste generation rates, and types of waste produced, are drawn from GESMO, and the environmental impacts associated with reprocessing and waste manage-

ment activities are normalized to a model reactor corresponding to that in WASH-1248.

The supplement represents a full and candid discussion of spent fuel reprocessing and waste management impacts, and is based on a thorough survey of the available data. Throughout the supplement there is frequent reference to the scholarly literature and technical reports. Indeed, over 175 reports and papers were cited and reviewed. All these references are publicly available.[2] In addition, copies of a petition for rulemaking, submitted by the Natural Resources Defense Council on August 10, 1976, relating to procedures and approach to the assessment of the environmental impacts of reprocessing and waste management, and public comments thereon, have been made available in the Commission's Public Document Room.

In general, the supplement indicates that the available data is adequate for a quantitative assessment of impacts from normal operations of all parts of the reprocessing and waste management system. Accidents were analyzed for most components of the complete system, but the bases for these analyses in the literature were varied, and all accident sequences could not be analyzed. Sample events are analyzed for all system components, and for one part (transportation) data on accidents from normal commercial activities is quite extensive. One of the goals of GESMO was to assess the cumulative impacts of the five fuel cycle alternatives. In Chapter VIII of that document these cumulative impacts through the year 2000 were discussed and tabulated in detail, including detail in the format used in Table S-3A of WASH-1248. These adequately describe the cumulative impacts of reprocessing and waste management with regard to the present generation of light water nuclear power reactors now under review or soon to come under review for licenses.

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[2] Those few which are not commonly in available literature have been made available in the Commission's Public Document Room.

In areas where information necessary for a complete quantitative assessment of environmental impacts is lacking (risks from sabotage, special risks from disposal of spent fuel or separated plutonium, and risks from failure in the long term of the geologic repository for high level waste) Federal programs are underway to resolve existing uncertainties.

With respect to risks from long term repository failure, representative studies have been done with varying degrees of depth and sophistication, but there are still uncertainties in areas such as the effect of waste presence on repository stability; the probabilities and consequences of various types of intrusive acts by humans; the availability of data to be used in modeling studies; the design and regulatory actions needed to minimize possibilities of repository failure; projection of future societal habits and demography, and, finally, the relative importance of the various potential initiating events. Research programs are underway which should resolve most of these uncertainties over the next few years.

Where data necessary for a complete quantitative assessment of impact is lacking, the Commission's expert judgment must be brought to bear on the information available. Among the issues the Commission expects to be addressed in comments on the Supplement and this proposed interim rule and in future hearings is whether the judgments, and supporting reasons, set forth in the supplement regarding such situations are sound. Where contrary judgments are suggested, the bases for those judgments should also be provided. The supplement also includes a summary presentation of ongoing Federal programs directed at providing more complete information. While these programs are not expected to provide substantial new data for a year or more, new information that does develop through these programs or the Commission's continuing analyses in con-

nection with the proceeding will be brought into the analysis.

The revised interim table is being proposed by the Commission as an interim substitute for the waste management and reprocessing values presently set forth in Table S-3A. After receipt and analysis of comments received in response to this notice, a final interim rule may be promulgated for use as a basis for LWR licensing. As the Commission's General Statement of Policy indicated, after promulgation of such a final interim rule, a public hearing will be held in order to facilitate effective public participation on the question whether the interim rule should be amended for future use and, if so, in what respect. The time, place, and format for the hearing will be set forth in a separate FEDERAL REGISTER notice. The interim rule would be used for LWR licensing only during the period of time required for completion of the public hearing and proceedings thereon. In order to reflect the interim character of the rule, any rule adopted will be made effective for no longer than an eighteen month period.

The Commission's present belief is that the supplemental survey can serve as an adequate foundation for such a rule. The supplement is based on a thorough survey of the available data on waste management and reprocessing impacts, and states to the extent now possible the uncertainties and risks associated with these impacts. While the court has required an acceptable substitute for the portions of Table S-3 which it found inadequately supported as the basis for the necessary environmental impact analyses, the obvious impacts of a lengthy cessaton of licensing pending final and complete analysis of the questions at issue may be considered in passing on the interim licensing question. Cf. "*Union of Concerned Scientists* v. *A.E.C.*", 499 F.2d 1069 (D.C. Cir. 1974) at 1081-1086. At the Commission's direction, a separate analysis of the environmental, social and economic impacts of the use of an interim rule for licensing of

LWR's has been prepared, entitled "Impacts of Later Reversing A Decision to Adopt or Not to Adopt An Interim Rule Permitting Construction or Operation of Nuclear Power Plants," October 1976. Assuming that a final rule permitting construction or operation of LWR's to proceed is adopted, this study suggests that failure to promulgate an interim rule would result in substantial increases in economic, social, and environmental costs. Substantial costs would also be incurred should construction or operation of LWR's proceed under an interim rule, and the final rule (when factored into individual impact statements) require that ongoing construction or operation cease. Such a cessation of construction or operation would, of course, only occur in this context if the present analysis of reprocessing and waste management impact proves to be dramatically in error. The Commission's present judgment is that such an outcome is unlikely.

The Commission is aware of the several comments filed with it in response to its General Statement of Policy and to the August 10 NRDC petition for rulemaking in this matter. The procedural aspects of that Statement and petition, to the extent not addresed here, will be dealt with in a notice of hearing to be published shortly. Technical aspects of the comments, including NRDC's extensive presentation and the economic data supplied by electric utility groups, have been considered in developing both the supplement and the statement of impacts. Of course, the technical judgments in both documents remain open for further comment in connection with the proposed rule.

The staff found the technical aspects of the NRDC comments, in the main, to state important elements in the area of waste management, but many were outside the scope of the present study. For instance, the staff relied on analysis of available technology (as suggested by NRDC) and dealt with some special waste types (such as spent fuel and plutonium) suggested for consideration. To the extent

that some of the suggestions for inclusion were beyond present technology or are not contemplated by any of those responsible for the management of wastes, they were judged not to contribute to a reasonable projection of impacts and were not included in the survey. And, in declining to consider such matters here, the Commission does not imply any judgment regarding the appropriateness of these questions for future inquiry in other proceedings.

This notice of proposed rulemaking does not address several issues identified in the General Statement of Policy. These issues include the questions whether the Commission, sua sponte, should initiate show cause proceedings against present holders of LWR construction permits, limited work authorizations, or operating licenses; whether circumstances revealed by the supplement warrant any change in the Commission's policy regarding how cause proceedings against present licensees initiated by others; and whether licenses may be issued in pending cases, and if so under what conditions, in advance of the adoption of an interim rule. Resolution of these questions, or some of them, may be affected by the action of the United States Court of Appeals for the District of Columbia last Friday, October 8. The court, in staying its mandate in the proceeding which led to issuance of the General Statement of Policy, indicated its view that the Commission could continue licensing activities "on condition that (the Commission) shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein." The Commission anticipates resolving these questions, in light of the supplement and the court's recent action, in the very near future. In particular, parties to existing show cause proceedings are being invited to submit views regarding the possible suspension of those show cause proceedings to the Secretary of the Commission on or before October 22, 1976.

Accordingly, pursuant to the Atomic Energy Act of 1954, as amended, NEPA, the Energy Reorganization Act of 1974, as amended, and sections 552 and 553 of Title 5 of the United States Code, notice is hereby given that adoption of the substance of the following Table is contemplated as a revision to Table S-3 of 10 CFR Part 51. All interested persons who desire to submit written comments or suggestions for consideration in connection with the proposed amendments, or to submit comments on the underlying supplement to Wash-1248 or impact analysis, should send them to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Section, by December 2, 1976. Copies of the supplement and impact analysis may be examined at the Commission's Public Document Room at 1717 H Street, Washington, D.C. and at the Commission's local Public Document Rooms. Copies of the comments received in response to this notice will be placed in the Commission's Public Document Room in Washington, as received. Single copies of the supplement and impact analysis may be obtained without charge, to the extent of supply, by writing to the Division of Document Control, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

(Sec. 161, Pub. L. 83-703, as amended, 68 Stat. 948, as amended (42 U.S.C. 2201); Sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332), Sec. 201, Pub. L. 93-438, as amended, 88 Stat. 1242, 89 Stat. 415 (42 U.S.C. 5841).)

For the Nuclear Regulatory Commission.

Dated at Washington, D.C. this 13th day of October 1976.

SAMUEL J. CHILK,
Secretary of the Commission.

TABLE 2.10

SUMMARY OF IMPACTS OF REPROCESSING AND WASTE MANAGEMENT PER RRY
(Columns F, G, and H of Table S-3A)

Natural Resource Use	F[d] Reprocessing (NUREG-0116)	F[d] Reprocessing (WASH-1248)	G[a] Waste Management (NUREG-0116)	G Waste Management (WASH-1248)	H[c] Transportation (NUREG-0116)	H Transportation (WASH-1248)	Fuel Cycle Totals[b] (NUREG-0116)	Fuel Cycle Totals[b] (WASH-1248)
Land (Acres)								
Temporarily Committed	32[h]	3.9	3.2	—	—	—	94	63
Undisturbed Area	28.5	3.7	2.9	—	—	—	73	45
Disturbed Area	3.5	0.2	0.28	—	—	—	22	18
Permanently Committed	0.12	0.03	2.6[e]	0.2	—	—	7.1	4.6
Overburden moved (millions of MT)	0.1	—	0.0015	—	—	—	2.8	2.7
Water (millions of gal)								
Discharged to air	6.6	4.0	0.38	0.13	—	—	159	156
Discharged to water bodies	54.8	6.0	0.058	0.13	—	—	11,090	11,040
Discharged to ground	—	—	0.96	—	—	—	124	123
Total Water	61.4	10.0	1.4	0.26	—	—	11,373	11,319
Fossil Fuel								
Electrical energy (thousand MW-hr.)	4.0	0.45	0.62	.0077	—	—	321	317
Equivalent coal (thousand MT)	1.5	0.16	0.22	.003	0.016	—	117	115
Natural Gas (million scf)	28.6	—	3.3	—	—	—	124	92

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Table 2.10 (Continued)

Natural Resource Use	F[d] Reprocessing (NUREG-0116)	F[d] Reprocessing (WASH-1248)	G[a] Waste Management (NUREG-0116)	G Waste Management (WASH-1248)	H[c] Transportation (NUREG-0116)	H Transportation (WASH-1248)	Fuel Cycle Totals[b] (NUREG-0116)	Fuel Cycle Totals[b] (WASH-1248)
Effluents								
Chemical (MT)								
Gases (MT)								
SO_x	5.4	6.2	0.030	—	0.045	—	4,400	4,400
NO_x	21.9	7.1	0.031	—	0.62	2.6	1,190	1,177
Hydrocarbons	0.5	0.02	0.02	—	0.062	—	14	13.5
CO	0.5	0.04	0.007	—	0.38	—	29.6	28.7
Particulates	0.6	1.6	0.62	—	0.022	—	1,154	1,156
Other Gases								
F^-	0.05	0.11	—	—	—	—	0.67	0.72
HCl	6E-4	—	0.013	—	—	—	0.14	—
Liquids								
SO_4	0.02	0.4	—	—	—	—	9.9	10.3
NO_3	—	0.9	—	—	—	—	25.8	26.7
Fluoride	—	—	—	—	—	—	12.9	12.9

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[a] Maximized for either of the two cycles (U-only and no recycle).
[b] Including columns A-E of Table S-3A of WASH-1248.
[c] For wastes only.
[d] Differences between NUREG-0116 and WASH-1248 estimates of reprocessing impacts are attributable to the use of new model plant for this Supplement.
[e] Disposal included here did not appear in WASH-1248.
[f] Not released to the environment.
[g] Major radionuclide releases in the Waste Management column are attributable to the disposal of spent fuel (no-recycle option) and the conservative assumption of complete release of gaseous nuclides in the geologic repository.
[h] The contributions to temporarily committed land are not prorated over 30 years, since the complete temporary impact accrues regardless of whether the plant services one reactor for one year or 57 reactors for 30 years.

(Table 2.10 continued on next page)

Table 2.10 (Continued)

Natural Resourse Use	F[d] Reprocessing (NUREG-0116)	F[d] Reprocessing (WASH-1248)	G[a] Waste Management (NUREG-0116)	G Waste Management (WASH-1248)	H[e] Transportation (NUREG-0116)	H Transportation (WASH-1248)	Fuel Cycle Totals[b] (NUREG-0116)	Fuel Cycle Totals[b] (WASH-1248)
Effluents (Cont'd.)								
Ca^{++}	—	—	—	—	—	—	5.4	5.4
Cl^{-}	0.09	0.2	—	—	—	—	8.5	8.6
Na^{+}	0.02	5.3	—	—	—	—	12.1	16.9
NH_3	—	—	—	—	—	—	10.0	11.5
Tailings Solutions (thousands)	—	—	—	—	—	—	240	240
Fe	—	—	—	—	—	—	0.4	0.4
Solids	—	—	0.42	—	—	—	91,000	91,000
Radiological (curies)								
Gases (Including entrainment)	—	—	0.0071	—	—	—	74.5	74.5
Rn-222	—	—	5.3E-7	—	—	—	0.02	0.02
Ra-226	—	—	5.3E-7	—	—	—	0.02	0.02
Th-230	—	—	7.9E-6	—	—	—	0.034	0.032
Uranium	0.000039	—	14[g]	—	—	—	18.1	16.7
Tritium (thousands)	18.1	16.7	290[g]	—	—	—	400	350
Kr-85 (thousands)	400	350	1.3[g]	—	—	—	1.3	0.0024
I-129	0.03	0.0024	—	—	—	—	0.83	0.024
I-131	0.83	0.024	0.003	—	—	—	0.021	1.0
Fission Products	0.18	1.0	0.0014	—	—	—	0.024	0.004
Transuranics	0.023	0.004	19[g]	—	—	—	24	—
C-14	24	—						

Table 2.10 (Continued)

Natural Resource Use	F[d] Reprocessing (NUREG-0116)	F[d] Reprocessing (WASH-1248)	G[a] Waste Management (NUREG-0116)	G Waste Management (WASH-1248)	H[e] Transportation (NUREG-0116)	H Transportation (WASH-1248)	Fuel Cycle Totals[b] (NUREG-0116)	Fuel Cycle Totals[b] (WASH-1248)
Effluents (Cont'd.)								
Liquids								
Uranium & Daughters	—	—	5.4E-6	—	—	—	2.1	2.1
Fission & Activation Products	—	—	5.9E-6	—	—	—	5.9E-6	—
Ra-226	—	—	—	—	—	—	0.0034	0.0034
Th-230	—	—	—	—	—	—	0.0015	0.0015
Th-234	—	—	—	—	—	—	0.01	0.01
Tritium (thousands)	—	2.5	—	—	—	—	—	25
Ru-106	—	0.15	—	—	—	—	—	0.15
Solids (buried onsite)[f]								
Other than high level (shallow)	0.52	—	4,700	—	—	—	5,300	601
TRU & HLW (deep)	—	—	1.1E+7	—	—	—	1.1E+7	—
Thermal (billions of Btu)	75.5	61	88	1.0	0.014	0.03	3,462	3,360

[a] Maximized for either of the two cycles (U-only and no recycle).
[b] Including columns A-E of Table S-3A of WASH-1248.
[c] For wastes only.
[d] Differences between NUREG-0116 and WASH-1248 estimates of reprocessing impacts are attributable to the use of new model plant for this Supplement.
[e] Disposal included here did not appear in WASH-1248.
[f] Not released to the environment.
[g] Major radionuclide releases in the Waste Management column are attributable to the disposal of spent fuel (no-recycle option) and the conservative assumption of complete release of gaseous nuclides in the geologic repository.
[h] The contributions to temporarily committed land are not prorated over 30 years, since the complete temporary impact accrues regardless of whether the plant services one reactor for one year or 57 reactors for 30 years.

FEDERAL REGISTER, VOL. 41, NO. 219,
THURSDAY, NOVEMBER 11, 1976

Environmental Effects of The Uranium Fuel Cycle

Supplemental General Statement of Policy

In a notice of proposed rule making dated October 13, 1976 and published in the Federal Register on October 18, 1976 (41 FR 45849) entitled "Uranium Fuel Cycle Impacts from Spent Fuel Reprocessing and Radioactive Waste Management", the Commission solicited comments on a proposed revision to Table S-3 of 10 CFR Part 51 and a related survey ("Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle" NUREG-0116-Supplement 1 to WASH-1248) and impact analysis ("Impacts of Later Reversing a Decision to Adopt or Not to Adopt an Interim Rule Permitting Construction or Operation of Nuclear Power Plants", October 1976). The October 13, 1976 notice of proposed rule making was an action forecast by a General Statement of Policy which the Commission issued (41 FR 34707, August 16, 1976) in response to two recent decisions (July 21, 1976) by the United States Court of Appeals for the District of Columbia Circuit (*Natural Resources Defense Council* v. *NRC* and *Aeschliman* v. *NRC*).

While the October 13, 1976 notice addressed a number of issues raised in the General Statement of Policy, certain questions were explicitly deferred with the notation that the Commission anticipated resolving these questions in the very near future. The deferred questions were whether the Commission, sua sponte, should initiate show cause proceedings against present holders of construction permits, limited work authorizations, or operating licenses for light water reactors; whether circumstances revealed by the supplement warrant any change in the Commission's policy regarding show cause proceedings against present licensees initiated by others; and whether licenses may be

issued in pending cases, and if so under what conditions, in advance of the adoption of an interim rule. This Supplemental Statement of Policy addresses two of those questions.

Two factors appear to the Commission to bear decisively on each of these questions. First, the United States Court of Appeals for the District of Columbia Circuit on October 8, 1976 has stayed its mandate in the proceedings which gave rise to the issuance of the General Statement of Policy. In staying its mandate the court indicated that the Commission could continue licensing activities "on condition that (the Commission) shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of the proceedings herein." Second, the breadth and quality of the present analysis of reprocessing and waste management impacts set forth in the supplemental survey lead the Commission to believe it improbable that the assessment that such impacts are slight will prove to be dramatically in error.

In light of the stay of the court's mandate, the quality of the present analysis of reprocessing and waste management impacts set forth in the supplemental survey, and the relatively short period of time anticipated before the interim rule can be adopted,[1] the Commission presently perceives no compelling reason, on either legal or policy grounds, for initiating sua sponte show cause proceedings against present holders of light water reactor construction permits, limited work authorizations, or operating licenses. Rather, the Commission's present belief is that it would not be justified in instituting new proceedings against the holders of such permits, authorizations and licenses on Table S-3 grounds pending the outcome of the current rulemaking. With respect to show cause-type proceedings

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[1] The Commission believes that a decision whether to adopt an interim rule can be made during January 1977.

initiated by others pursuant to the August 16, 1976 General Statement of Policy, which are presently under way, the Memoranda and Orders we are issuing today in those proceedings have the effect of suspending them pending anticipated adoption of an interim rule.

On the question of issuing licenses in pending cases, five principal considerations are relevant and manifest. First, it would be inappropriate for the Commission to continue to license facilities on the basis of the existing reprocessing and waste storage values of Table S-3 without taking account of the improved and expanded analysis now at hand. Second, that improved and expanded analysis is not now reflected in any currently applicable Commission rule. Third, while continued licensing solely on the basis of the present Table S-3 values for reprocessing and waste management would be inappropriate, it is now clear that the court envisions further licensing; and the information now available to the Commission indicates that a halt in licensing activity is more likely to have a severe social and environmental impact than continued licensing on the conditional basis the court suggests, taking some account of the newly developed analysis. Fourth, there is no bar to the use of the revised chemical reprocessing and waste storage values of the S-3 Table in pending proceedings—prior to the adoption of an interim rule—on the basis of individual NEPA analyses of reprocessing and waste management impacts. In connection with this last consideration, however, there is the significant practical constraint raised by the needless duplication which proceeding both by rulemaking and in individual licensing hearings would entail and the overall delay that would result. The Commission is sharply aware of the advantages of avoiding such duplication and attendant strain on the resources of parties by focusing resolution of issues which may be raised regarding the survey in a single proceeding. Finally, the Commission anticipates that the interim rule as promulgated will closely resemble the proposed rule published on October 13, and like that proposed rule, will not produce results significantly different from those obtained under the current rule.

With these considerations in mind, the Commission has concluded that licensing may resume on a conditional basis using the existing Table S-3 if, but only if, the revised values are examined to determine whether, if those values were used, the result would tilt the cost-benefit balance against the issuance of the license. Under this approach, the accuracy of the revised values will not be an issue in the licensing proceeding. While this approach may leave the validity of licenses in some doubt, it has the advantage of lessening duplication of the resources of the parties to the proceedings. Most importantly it responds to the suggestion in the court's order of October 8, 1976 that continued licensing under the existing rule on a conditional basis would be appropriate, without ignoring the newly developed values. The additional analysis called for may also avoid the need for further proceedings on these licenses, should rulemaking eventuate in adoption of these or comparable values.

In sum, the Commission has concluded that subject to the limitations hereinafter expressed, full-power operating licenses, construction permits and limited work authorizations may be issued in pending cases in advance of the adoption of an interim rule on the basis of the currently effective chemical reprocessing and waste storage values of Table S-3. The Commission directs that such licenses may be issued only if further, specific analysis is performed to determine whether, if the revised chemical reprocessing and waste storage values set forth in the Commission's notice of proposed rulemaking of October 18, 1976 were used, the result would tilt the cost-benefit balance against the issuance of the license. If it appears that the balance would be so tilted, then the proceeding will be suspended,

with respect to chemical reprocessing and waste storage issues, pending further action by the Commission. Under this approach the accuracy of the revised values is not to be an issue in the proceeding, but the determination whether the cost-benefit balance would be tilted, if the revised values were used, is fully at issue in the proceeding. Further, any full-power operating license, construction permit or limited work authorization issued under this approach must be conditioned in accordance with the court's order (staying its mandate) dated October 8, 1976.

To the extent that this Supplemental General Statement of Policy differs from the Commission's General Statement of Policy of August 16, 1976, the latter is modified accordingly.[2]

Dated at Washington, D.C. this 5th day of November, 1976.

For the Nuclear Regulatory Commission.

SAMUEL J. CHILK,
Secretary of the Commission.

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[2] In seeking a stay of mandate from the court of appeals, the Commission informed the court of its General Statement of Policy and the intention there stated to make further licensing actions depend on the basis of a further request to the court, to be made within a few weeks of issuance of the revised survey. In the Commission's view, the specific reference to continued licensing in the court's order moots this proposed action. The Commission also notes that the court granted all petitions for stay, not merely its own; the other petitions filed were not conditioned as was the Commission's.

FEDERAL REGISTER, VOL. 42, NO. 49,
MONDAY, MARCH 14, 1977

TITLE 10—ENERGY

CHAPTER I—NUCLEAR REGULATORY COMMISSION

PART 51—LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Uranium Fuel Cycle Impacts From Spent Fuel Reprocessing and Radioactive Waste Management

Agency: Nuclear Regulatory Commission

Action: Effective interim rule.

Summary: The Commission has previously identified environmental impact values for the uranium fuel cycle which are to be included in environmental reports and environmental impact statements for individual light water nuclear power reactors. This rule amends the prior regulations so as to incorporate revised values, based on a new study of the available information, for the nuclear waste management and nuclear fuel reprocessing portions of the fuel cycle.

Effective Date: March 14, 1977.

For Further Information Contact:

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Supplementary Information: On October 18, 1976, the Nuclear Regulatory Commission (hereafter Commission or NRC) gave notice in the FEDERAL REGISTER (41 FR 45849) that in contemplated promulgating an interim rule which would revise Table S-3 of 10 CFR Part 51 to include new specific impact values derived in light of its "Environmen-

tal Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle" NUREG—0116 (Supplement 1 to WASH-1248 (hereinafter referred to as "Supplement"). Interested persons were invited to submit written comments on the Supplement and proposed interim rule by December 2, 1976, copies of which are available for public inspection at the Commission's Public Document Room at 1717 H Street, N.W., Washington, D. C. 20555. After careful consideration of the comments received and within the context of the following discussion, the Commission has adopted the values set forth in the interim rule which will remain effective for eighteen months unless good cause is shown to extend the period of effectiveness.

Background

Pursuant to the National Environmental Policy Act of 1969 (NEPA), an environmental impact statement must be prepared by the Commission in connection with issuance of a construction permit or operating license for each light water nuclear power reactor. These statements should contain a detailed evaluation of the environmental impacts of construction and operation of the plant and a discussion of reasonable alternatives, as well as an overall assessment of the costs and benefits of the liccensing action.

In November 1972, a document entitled "Environmental Survey of the Nuclear Fuel Cycle" (hereinafter referred to as "Survey") was published by the Directorate of Licensing of the Atomic Energy Commission (AEC). Comments on the Survey were solicited, and an informal rulemaking hearing was held on February 1 and 2. 1973. The purpose of the hearing was to consider possible amendments to Appendix D of 10 CFR Part 50 which would, by rule, specify the environmental effects of the uranium fuel cycle to be factored into the assessment of costs and benefits in environmental impact statements for individual light water nuclear power reactors (LWR's). Written comments

were received in response to the Federal Register notice, and recommendations for improvement were offered during the hearings. After consideration of the written comments and the hearing record, the AEC promulgated the final fuel cycle rule (the so-called Table S-3) on April 22, 1974 (39 FR 14188). It was intended that with the inclusion of environmental impacts from Table S-3, the environmental impact statements for individual LWR's would set forth a full and candid assessment of costs and benefits consistent with the legal requirements and spirit of NEPA. The AEC indicated in its decision that the rule and Survey would be reexamined from time to time to accommodate new information. The same Table S-3 was included in 10 CFR Part 51.

On January 19, 1975, the Atomic Energy Commission was abolished and its licensing and regulatory responsibilities transferred to the Nuclear Regulatory Commission. On July 21, 1976, the United States Court of Appeals for the District of Columbia Circuit decided *Natural Resources Defense Council* v. *NRC*,[1] a case involving judicial review of the fuel-cycle rule, and *Aeschliman* v. *NRC*,[2] a related case involving the exclusion of fuel cycle issues from an individual power reactor licensing proceeding. The court approved the overall approach and methodology of the fuel cycle rule and found that, regarding most phases of the fuel cycle, the underlying Environmental Survey represented an adequate job of describing the impacts involved.[3] However, the court found that the rule was inadequately

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[1] — F. 2d — (D.C. Cir. 1976), 9 ERC 1149, *cert. granted sub nom., Vermont Yankee Nuclear Power Corp.* v. *Natural Resources Defense Council*, 45 U.S.L.W. 3570 (U.S. Feb. 22, 1977) (No. 76-419). No action has as yet been taken by the Supreme Court on a related petition for certiorari filed in *Baltimore Gas and Electric Co .v. Natural Resources Defense Council*, No. 76-458.

[2] — F. 2d — (D.C. Cir. 1976), 9 ERC 1289, cert. granted, 45 U.S.L.W. 3570 (U.S. Feb. 22, 1977), (No. 76-528).

[3] Note 1. supra, at 1159.

supported by the record insofar as it treated two particular aspects of the fuel cycle—the impacts from reprocessing of spent fuel and the impacts from radioactive waste management.

In response to the court decision, the Commission issued a General Statement of Policy (41 FR 34707. August 16, 1976) announcing its intention to reopen the rulemaking proceeding on the environmental effects of the fuel cycle to supplement the existing record on waste management and reprocessing impacts to determine whether the rule should be amended and, if so, in what respect.[4] The Commission thus indicated its intent to handle the question of the environmental impacts of waste management and reprocessing generically rather than in individual licensing proceedings, a decision supported by language of the court in the *Vermont Yankee* case.[5] The Commission directed the Staff to prepare on an expedited basis a well-documented supplement (NUREG-0116) to the Survey (WASH-1248) to establish a basis for identifying environmental impacts associated with fuel reprocessing and waste management activities that are attributable to the licensing of a model light-water reactor.

The revised survey was completed in October, 1976, and the Commission issued the October 18, 1976 notice regarding the proposed interim rule. The comments received in response to that notice and the Commission's responses to those comments comprise NUREG-0216, Supplement 2 to WASH-1248 (hereinafter "Supplement 2").

The Commission indicated in that notice that the values proposed therein were to be considered as a proposed interim substitute for the values originally set forth in Table S-3A of WASH-1248. After receipt and analysis of comments received, a final interim rule was to be promulgated for use in LWR licensing. The interim rule was to be made permanent only after a public hearing had been held to further facilitate effective public participation. Under a Supplemental Statement of Policy published in the FEDERAL REGISTER on November 11, 1976 (41 FR 49898) licensing of individual LWR's was resumed on a conditional basis pending promulgation of the final interim rule provided that the old values for reprocessing and waste management contained in Table S-3A were compared with the values in the proposed interim rule to determine if application of the new values would tilt the cost/benefit balance in individual cases. All values in the table except those relating to waste management and reprocessing were to remain the same.

[4] The Court of Appeals stayed its mandate in the proceedings which gave rise to the General Statement of Policy, and the Supreme Court's grant of certiorari has the legal effect of continuing the stay of mandate in effect.

[5] Note 1, supra, n.17, at 1154-1155.

The Commission has decided to pattern the final interim rule after the original Table S-3. Supplements 1 and 2 provide detailed narrative explanation of the new values in Table S-3 and give greater illumination to the background and context of the revised values.

SCOPE AND PURPOSE OF SUPPLEMENTS AND RULE

At the outset the Commission wishes to make clear that its purpose in preparing Supplements 1 and 2 and the interim rule was quite limited. The sole purpose of preparation of Supplement 1 and the rule was to identify and quantify environmental impacts attributable to the reprocessing and waste management portions of the LWR fuel cycle. The environmental impacts so identified are to be used only in the preparation of environmental impact statements for individual light water reactors. Supplement 1 and the rule have fulfilled this purpose. It was not the purpose of this proceeding to decide which of the various waste management alternatives should or will be employed in practice,

or to develop site selection criteria or to define parameters for licensing of any of the Energy Research and Development Administration's (ERDA) waste management facilities. A separate and comprehensive series of programs has been undertaken to serve these broader purposes. ERDA has several programs in progress including a program for the preparation of a generic environmental impact statement on high-level waste management, a program to evaluate geologic formations and specific sites for repositories, programs in research and development of waste solidification methods and development of interim storage sites. NRC's ongoing programs include the preparation of regulations for the licensing of ERDA waste management facilities and activities, the development of performance criteria for solidified high-level waste and the development of site suitability criteria for high-level waste repositories.

These programs are described in greater detail in Appendices B and C to Supplement 1 and other agency programs are described in Appendix F to Supplement 2. Supplement 1 itself and the S-3 rule are only a very small part of these ongoing activities.

In addition to these ongoing programs the Commission has undertaken the preparation of two generic environmental impact statements on fuel cycle issues. One, the Generic Environmental Statement on Mixed Oxide Fuels, "GESMO," is in the legislative hearing stage of a rulemaking proceeding. Work has commenced on the other, the Generic Environmental Impact Statement on Uranium Milling, and a draft statement is expected in mid-1978.

The Commission has used some of the information in the GESMO document, NUREG-0002, in its preparation of Supplement 1 and the interim rule in much the same manner as it has used other available literature. While the Commission realizes that additional information may be generated during the GESMO proceeding, all of the information used in the Supplement, including the relevant in-

formation from NUREG-0002, will be re-examined during preparation of the final fuel cycle rule and will be subjected to close scrutiny during public hearings on the final rule along with other available information. To the extent that comments in this proceeding have raised issues related to the material in the GESMO document, the Commission has independently evaluated the comments and taken them into account in this proceeding.

Sufficiency of Information and Assessment

In order to fulfill its purpose of identifying in a generic proceeding the environmental impacts attributable to the reprocessing and waste management portions of the LWR fuel cycle, the Commission had to decide whether the information produced by Supplements 1 and 2 provided a sufficient basis for proceeding with an interim rule. The Commission addressed the question whether the risks of proceeding on the basis of information which may later be called into question in a final rulemaking proceeding outweigh the costs which would certainly flow from a hiatus in LWR licensing. See *National Air Carrier Association* v. *CAB*, 436 F.2d 185, 191 (D.C. Cir. 1970). The costs attributable to a hiatus in licensing were explored by the Commission's Staff in a paper entitled "Impacts of Adopting or Not Adopting an Interim Rule Permitting Construction or Operation of Nuclear Power Plants" which was cited by the Commission in its Supplemental Statement of Policy (41 FR 49898) and placed in the Public Document Room along with NUREG-0116. The paper concluded that the environmental and economic costs attributable to a twelve-month delay in the licensing of reactors were substantial.

A number of comments on the Supplement and the proposed interim rule also dealt with the adequacy of this study. These comments are discussed in detail in the document entitled "Response to Comments on a Staff paper entitled 'Impacts of Adopting or Not Adopting an Interim

Rule Permitting Construction or Operation of Nuclear Power Plants' ". In the Commission's view, the study was adequate to fulfill its limited purpose of highlighting for the Commission and others the costs of a hiatus in licensing that would be caused by the failure to promulgate an interim rule. Even if environmental costs of a delay in licensing were excluded from consideration, the economic costs of a twelve-month delay would be high. Thus, the costs which would flow from a hiatus in licensing were explored by the Commission and the Commission has concluded that they would be substantial. However, as was noted above, costs alone could not determine the Commission's resolution of the question whether to proceed by interim rule. Against these costs must be weighed the risks of proceeding by interim rule where the sufficiency of the information supporting the rule might be later called into question during the final rulemaking proceeding on the permanent rule. Accordingly, the Commission critically examined the Supplement and, in light of some comments questioning its adequacy attempted to judge its quality.

The Supplement supporting the new interim rule (NUREG-0116) was the product of extensive effort by a Task Force comprised of a number of highly qualified individuals with years of experience in the field. Since a great deal of work in the field had already been completed when the Task Force began its analysis, the Task Force was not required to start completely fresh in its consideration of the issues. Supplement 1 is not merely an uncritical description of the available literature on the subject of reprocessing and waste management. Rather the Task Force carefully examined voluminous amounts of information in the field, selected from those sources the best possible information available and then critically analyzed the information and, where warranted, rechecked calculations and performed independent analysis. Further, the Staff performed a detailed analysis of the comments received on the Supplement. The responses to every substantative comment received are contained in Supplement 2, NUREG-0216. Supplements 1 and 2 contain a detailed analysis of the impacts of waste management and reprocessing and provide a sufficient informational basis for the interim rule promulgated herein.

The Commission has observed that there are gaps in the information needed for detailed assessment of waste management and disposal technology. While there is the need to obtain additional data and to consider from time to time any new findings that would have a bearing upon the values set forth in Table S-3, the lack of some relevant data in certain areas by no means excuses the Commission from making an informed and reasoned judgment now regarding the environmental impacts which may flow from waste management and reprocessing activities.

The situation is analogous to the Atomic Energy Commission's issuance of interim acceptance criteria for emergency core cooling systems, as reviewed in *Union of Concerned Scientists* v. *AEC*, 499 F.2d 1069 (D.C. Cir. 1974). As the AEC did in that instance, the Commission recognizes that "analytical methods capable of realistic prediction of all phenomena known or suspected to occur" in the course of waste management and disposal are not available and agrees that definitive experiments have not been carried out. However, the Commission's position, which is reflected in the Task Force Report as revised, is the same as the one that was given judicial acceptance in Union of Concerned Scientists:

> In the absence of such perfection, adequate assurance of safety can be obtained from an appropriately conservative analysis based on available experimental information. In areas of incomplete knowledge, conservative assumptions or procedures must be applied. When further experimental information or improved calculation techniques become available, the conservatisms presently imposed will be reevaluated and a more realistic approach will be taken. 449 F. 2d 1069, at 1086.

It should be noted that the interim rule does not deal with a safety question as did the emergency core cooling system but rather attempts to quantify the environmental impacts of reprocessing and waste management. "[C]onservative analysis based on available experimental information" is even more appropriate in such a case where the goal is not to reach a conclusion whether a level of safety has been met, but rather to develop values for use in environmental cost benefit analyses.

The Task Force Report (NUREG-0116) and the Comments and Responses (NUREG-0216) contain and document numerous conservatisms applied to the analysis of environmental impacts from waste management and reprocessing activities. In those few cases where detailed estimates could not be made, the Task Force exercised its expert judgment to reach a best estimate. Since a calculation could not be made, the conservatism of these few judgments cannot absolutely be established. However, it is the Commission's view that the impacts estimated on expert judgments are quite small in any case and that adequate conservatism has been applied.

The Commission would be reluctant to proceed if it believed the values in Table S-3, and the information from which they are derived, were called into question to any significant degree by substantial evidence, but this is not the case. *Union of Concerned Scientists,* 499 F.2d at 1085. To some extent, as noted above, the setting of values in Table S-3 involved making "policy judgments where no factual certainties exist or where facts alone do not provide the answer." *Industrial Union Department, AFL-CIO* v. *Hodgson,* 499 F.2d 467, 476 (D.C. Cir. 1974). In such cases —especially where the evidence is "difficult to come by, uncertain, or conflicting because it is on the frontiers of scientific knowledge"—it is appropriate for the Commission to proceed to apply its expertise; its conclusions must be rationally justified, not based on hunches or wild guesses, but conclusions may be drawn "from theoretical projections from imperfect data, from probative preliminary data not

yet certifiable as 'fact', and the like." *Ethyl Corp.* v. *EPA,* 541 F.2d 1, 28 (D.C. Cir. 1976); see also *Amoco Oil Co.* v. *EPA,* 501 F.2d 722 (D.C. Cir. 1974). The Commission may, as to some extent it has done here, make probabilistic assessments that must suffice until data becomes "sufficiently quantifiable to yield to meaningful analysis." *Union of Concerned Scientists, supra,* 499 F.2d at 1093.

The Commission has also been mindful of its obligation to identify the particular findings in the literature that it deems significant, *Portland Cement Association* v. *Ruckelshaus,* 486 F.2d 375, 400 (D.C. Cir. 1973), cert. denied 417 U.S. 921 (1974), and to examine the reasons for mistakes in prior assessments in order that its assessment may be complete. In this regard, the Commission has examined past experiences in the waste management field. There, in several instances, past scientific judgments were shown to have been in error. However, one cannot look at those mistakes without recognizing that developments in technology have since occurred which make repetition of past mistakes less likely. Past experience has provided an indication of the types of impacts that are possible. Furthermore, the Supplement is based on very conservative assumptions regarding levels of releases. The Supplement has included in its model only technologies which are presently available and the Commission has made every effort to make the most thorough evaluation of the associated environmental impacts that the present state of available knowledge will permit.

In summary, the Commission has decided to proceed with promulgation of the interim rule. It has looked at the uncertainties and unknowns identified in the Supplement. It has weighed the risks of proceeding with licensing on the basis of the interim rule against the costs of not proceeding. The Commission has found that the costs of not proceeding outweigh the risks of proceeding by interim rule especially given the fact that a relatively short period of time, eighteen months, may pass before a more thorough discussion of the issues will be completed in the final rulemaking proceeding. There is no perceived need for the Commission to wait for

site specific information or to wait for ERDA's generic environmental impact statement on high-level waste management. In some areas—including critical areas where a substantial measure of expert judgment had to be applied—it is unlikely that substantial new information of a quantitative nature will be available for years. As the Court said in *Citizens for Safe Power* v. *NRC*, 524 F.2d 1291, 1297 (D.C. Cir. 1975):

> Absolute or perfect assurances are not required by (the Atomic Energy Act), and neither present technology nor public policy admit of such a standard. It was for the Commission to arrive at a rational, practical and principled conclusion upon the basis of reasonably available evidence.

Interim Rulemaking

Some of the comments have raised the question whether an interim rule, without the benefit of oral hearings, is an appropriate mechanism for establishing the impacts presented in Table S-3. The Commission continues to believe that such action is fully warranted, in the light of the competing factors identified above.

The fixing of values under an interim rule is consistent with the opinion of the court in *NRDC* v. *NRC*, as well as settled case and statutory law. Indeed, interim rules may be adopted without any prior notice and opportunity for public comment if public procedures would be impracticable, unnecessary, or contrary to the public interest, 5 U.S.C. § 553(b). The AEC's adoption of interim acceptance criteria for emergency core cooling systems was found to be a valid exercise of this authority, for example, in Union of Concerned Scientists, supra, 499 F.2d at 1085.

Furthermore, the quality of the comments and of the Task Force responses to those comments as well as the additional information provided in the course of this interchange give the Commission confidence that no major issues lie hidden as a result of this procedure. While the Commission has chosen to use notice and comment procedures for this interim rulemaking, it intends to held public hearings

in connection with the final rulemaking to facilitate additional effective public participation. The time, place, and format for the hearing will be set forth in a separate Federal Register notice. Such public hearings are, however, not required to satisfy any constitutional or statutory mandate and, therefore, the use of notice and comment procedures will suffice for interim rulemaking. In *NRDC* v. *NRC*, supra, the Court of Appeals for the District of Columbia Circuit referred neither to the Constitution nor to the Administrative Procedure Act when it set for itself the task "to decide whether the procedures provided by the agency were sufficient to ventilate the issues." 9 ERC at 1156. Rather, the court's analysis of asserted procedural inadequacies in the earlier S-3 proceedings apparently rests on judicial notions, fundamentally common-law in character, concerning what is required to produce a record that will facilitate judicial review.[6] The same court has stated, "Although we have recognized that provision of oral hearings may be wise in some instances, we have never held that due process requires oral presentation of views as a matter of course," *Pickus* v. *U.S. Board of Parole*, 543 F. 2d 240, 246 (D.C. Cir. 1976). In circumstances calling for prompt action it follows that use of notice and comment procedures for interim rulemaking is sufficient. The Commission has made every effort to present a full statement of available information, and to explain the reasons which persuade it to adopt, for a relatively short period, the values set forth in revised Table S-3.

In order to reflect its interim character, the rule that is presently being adopted will be made effective for the limited period of eighteen months. The Commission believes that final rulemaking proceedings can be completed within this period and wishes to stress that the present rule is only a temporary measure pending completion of the final rulemaking proceedings which will reflect additional public participation. However, if good cause is shown, the period of effectiveness of the interim rule can be extended.

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[6] As earlier indicated in note 1, supra, the Supreme Court has granted certiorari in *NRDC* v. *NRC*.

The amended rule incorporating revised Table S-3 is being made effective immediately because the Commission has determined that it has good cause for doing so: the revised Table S-3 provides a more current and comprehensive basis for evaluation than does the original Table S-3; there is a need to base licensing decisions on the best available information; and the values in the interim rule are not substantially different from the values in the proposed interim rule upon which interested persons had the opportunity to comment. (Supplemental General Statement of Policy, 41 FR 49898, November 11, 1976; see also 5 U.S.C. 553(d)(3)).

Accordingly, any operating license, construction permit, or limited work authorization (LWA) that may hereafter be issued must take into account the revised values contained in this rule. Licenses, permits, or limited work authorizations issued before July 21, 1976 in which the originally effective chemical reprocessing and waste storage values of Table S-3 were utilized will remain effective, principally because the values in the new interim rule are not sufficiently different from the values in the original Table S-3 to warrant revocation or suspension on cost-benefit grounds. Any show cause or similar proceedings initiated in these cases pursuant to the August 16, 1976 General Statement of Policy will be terminated.

Operating licenses, construction permits or limited work authorizations granted after July 21, 1976 and which therefore were subject to the outcome of the proceedings in *NRDC* v. *NRC*, will also remain in effect, and any show cause or similar proceedings initiated in response to the August 16, 1976 General Statement of Policy in these cases are also to be terminated. The values in the interim rule are not substantially different from those which, under the Commission's Supplemental General Statement of Policy, were required to be considered by Atomic Safety and Licensing Boards in connection with the issuance of such licenses. Where the Boards have found that the cost-benefit balance would not be tilted by the values in the proposed

interim rule, no further proceedings are necessary since the values in the final interim rule are not substantially different from the values in the proposed rule. Similarly, cases now pending before the Boards in which the evidentiary record on fuel cycle impact issues has been compiled are to be decided on the basis of the existing record; since the interim rule values are not substantially different from those in the previously proposed rule, the reopening of the record to receive additional testimony would not appear to be justified.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, the National Environmental Policy Act of 1969, as amended, and sections 552 and 553 of Title 5 of the United States Code, the following amendment to 10 CFR Part 51 is published as a document subject to codification, to be effective on March 14, 1977.

10 CFR Part 51 is amended by revising § 51.20(e) to read as follows:

§ 51.20 Applicant's Environmental Report—Construction Permit Stage.

* * * * * * * * * * *

(e) In the Environmental Report required by paragraph (a) for light-water-cooled nuclear power reactors, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low level wastes and high level wastes related to uranium fuel cycle activities to the environmental costs of licensing the nuclear power reactor, shall be as set forth in Table S-3, Summary of environmental considerations for uranium fuel cycle. No further discussion of such environmental effects shall be required. This paragraph does not apply to any applicant's environmental report submitted prior to June 6, 1974. The values set forth in Table S-3 in this paragraph will not be applied in any proceeding as of September 14, 1978.

TABLE S-3.

SUMMARY OF ENVIRONMENTAL CONSIDERATIONS FOR URANIUM FUEL CYCLE[1]

[Normalized to model LWR annual fuel requirement (WASH-1248) or reference reactor year (NUREG-0116)]

Natural resources use	Total	Maximum effect per annual fuel requirement or reference reactor year of model 1,000 MWe LWR
Land (acres):		
Temporarily committed[2] ...	94	
Undisturbed area	73	
Disturbed area	22	Equivalent to 110 MWe coal-fired powerplant.
Permanently committed	7.1	
Overburden moved (millions MT).	2.8	Equivalent to 95 MWe coal-fider powerplant.
Water (millions of gallons):		
Discharged to air	159	= 2 pct of model 1,000 MWe LWR with cooling tower.
Discharged to water bodies .	11,090	
Discharged to ground	124	
Total	11,373	<4 pct of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousand of megawatt hours).	321	<5 pct of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT).	117	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	124	<0.3 pct of model 1,000 MWe energy output.

See footnotes at end of table.

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Table S-3 (Continued)

Natural resources use	Total	Maximum effect per annual fuel requirement or reference reactor year of model 1,000 MWe LWR
Effluents—chemical (MT):		
Gases (including entrainment[3]		
SO_x	4,400	
No_x[4]	1,190	Equivalent to emissions from 45 MWe coal-fired plant for a year.
Hydrocarbons	14	
CO	29.6	
Particulates	1,154	
Other gases:		
F^-	.67	Principally from UF_6 production, enrichment, and reprocessing. Concentration within range of state standards—below level that has effects on human health.
HCl	.014	
Liquids:		
SO_4^-	9.9	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constituents that require dilution and the flow of dilution water are: NH_3—600 ft^3/s. NO_3—20 ft^3/s. Fluoride—70 ft^3/s.
NO_3^-	25.8	
Fluoride	12.9	
Ca^{++}	5.4	
Cl^-	8.5	
Na^+	12.1	
NH_3	10.0	
Fe	.4	

See footnotes at end of table.

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Table S-3 (Continued)

Natural resources use	Total	Maximum effect per annual fuel requirement or reference reactor year of model 1,000 MWe LWR
Effluents (con't)		
Tailings solutions (thousands of MT).	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—radiological (curies):		
Gases (including entrainment):[5]		
Rn-222	74.5	Principally from milling operations and excludes contributions from milling.
Ra-226	.02	
Th-230	.02	
Uranium	.034	
Tritium (thousands)	18.1	
C-14	24	
Kr-85 (thousands)	400	
Ru-106	.14	Principally from fuel reprocessing plants.
I-129	1.3	
I-131	.83	
Fission products and transuranics.	.023	
Liquids:[6]		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.

See footnotes at end of table.

Table S-3 (Continued)

Natural resources use	Total	Maximum effect per annual fuel requirement or reference reactor year of model 1,000 MWe LWR
Effluents (con't)		
Ra-226	.0034	From UF_6 production.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 pct of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Fission and activation products.	$5.9\times10_4$	
Solids (buried on site):		
Other than high level (shallow).	11,300	9,100 Ci comes from low-level reactor wastes and 1,500 Ci comes from reactor decontamination and decommissioning—buried at land burial facilities. 600 Ci comes from mills—included in tailings returned to ground~60 Ci comes from conversion and spent fuel storage. No significant effluent to the environment.
TRU and HLW (deep)	1.1×10^7	Buried at Federal repository.
Effluents—thermal (billions of British thermal units).	3,462	<4 pct of model 1,000 MWe LWR.
Transportation (person-rem): Exposure of workers and general public.	2.5	
Occupational exposure (person-rem).	22.6	From reprocessing and water management.

See footnotes at end of table.

FOOTNOTES

[1] Data supporting this table are given in the "Environmental Survey of the Uranium Fuel Cycle," WASH-1248, April 1974; the "Environmental Survey of the Reprocessing and Waste Management portions of the LWR Fuel Cycle," NUREG-0116 (Supp. 1 to WASH-1248); and the "Discussion of Comments Regarding the Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0216 (Supp. 2 to WASH-1248). The contributions from reprocessing, waste management and transportation of wastes are maximized for either of the 2 fuel cycles (uranium only and no recycle). The contribution from transportation excludes transportation of cold fuel to a reactor and of irradiated fuel and radioactive wastes from a reactor which are considered in table S-4 of sec. 51.20(g). The contributions from the other steps of the fuel cycle are given in columns A-E of table S-3A of WASH-1248.

[2] The contributions to temporarily committed land from reprocessing are not prorated over 30 years, since the complete temporary impact accrues regardless of whether the plant services 1 reactor for 1 yr. or 57 reactors for 30 yrs.

[3] Estimated effluents based upon combustion of equivalent coal for power generation.

[4] 1.2 pct from natural gas use and process.

[5] Gaseous effluents from waste management contribute about 9 person-rem (total body) to offsite U.S. population per annual fuel requirement or reference reactor year for the uranium only recycle option. This contribution for the no recycle option is 170 person-rem. For comparison, all radiological gaseous effluents from fuel cycle operations contribute about 370 person-rem (total body) to offsite U.S. population per annual fuel requirement or reference reactor year. This dose is <0.002 pct of the average natural background radiation dose to this population. Fuel reprocessing contributes about 330 person-rem (total body) of the total of 370 person-rem to offsite U.S. population. Person-rem is an expression for the summation of whole body doses to individuals in a group. Thus, if each member of a population group of 1,000 people were to receive a dose of 0.001 rem (1 millirem), or if 12 people were to receive a dose of 0.5 rem (500 millirem) each, the total person-rem dose in each case would be 1 person-rem. The dose to the offsite U.S. population due to average natural background radiation is about 2×10^7 person-rem per year. The Commission's final environmental statement on use of mixed-oxide fuel in LWR's (NUREG-0002) indicates a maximum release of about 4800 Ci of Rn-222 when contributions from mining are included. NUREG-0002 also indicates that mining contributes about 500 person-rem (total body) and that milling contributes about 100 person-rem (total body) of a total of about 610 person-rem (total body) to offsite U.S. population per annual fuel requirement.

[6] Liquid radiological effluents from reprocessing and waste management activities in the fuel cycle contribute 1.4×10^{-4} person-rem (total body) to offsite U.S. population per annual fuel requirement or reference reactor year. For comparison all radiological liquid effluents from fuel cycle operations contribute about 100 person-rem (total body) to offsite U.S. population per annual fuel requirement or reference reactor year. This dose is <0.0005 pct of the average natural background radiation dose to this population.

Effective date: The foregoing amendments take effect on March 14, 1977.

(Sec. 102, (Pub. L. 91-190, 83 Stat. 853, as amended, Pub. L. 94-83, 89 Stat. 424 (42 U.S.C. 4332); Sec. 161, as amended, Pub L. 83-703, 68 Stat. 948 (42 U.S.C. 2201); Sec. 202, Pub. L. 93-438, 88 Stat. 1244 (42 U.S.C. 5842))

Dated at Washington, D.C., this 7th day of March 1977.

For the Nuclear Regulatory Commission.

SAMUEL J. CHILK,
Secretary of the Commission.

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY

August 2, 1973

MEMORANDUM FOR HEADS OF AGENCIES

SUBJECT: Revision of agency procedures for preparation of Environmental Impact Statements

On Wednesday, August 1, 1973, after extensive consultation with interested agencies and opportunity for public comment, the Council issued revised guidelines for the preparation of environmental impact statements pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA). Attached is a copy.

Section 1500.3(a) requires agencies to revise their NEPA procedures for preparation of impact statements so that they conform with the Council's revised guidelines. This requirement applies to procedures issued at both the departmental and sub-departmental level. Attachment A to this memorandum is a list of some of the major changes between the Council's new guidelines and its April 1971 guidelines that should be considered by your staff. The Council's staff will contact your staff in the very near future to arrange for timely consultation, pursuant to the requirements of Section 1500.3(a), on the specific changes required in your agency's procedures.

The effective date for the new guidelines (incorrectly listed in the *Federal Register* as a result of a typesetting error as January 28, 1973) is January 28, 1974. Revised agency NEPA procedures are required to be published in the *Federal Register* in proposed form for public comment before November 1, 1973, and in final form no later than January 28, 1974. Draft and final impact statements filed with the Council after that date are formally subject to the requirements of the new guidelines.

The Council strongly recommends, however, that agencies adopt several of the new provisions (listed in Attachment B) on an interim basis, within the next 45 days. These new provisions are aimed at more effectively involving the public in the impact statement process; none of them should entail significant administrative burdens.

/s/ RUSSELL E. TRAIN
Russell E. Train
Chairman

ATTACHMENT A

Major Changes Between New CEQ Revised NEPA Guidelines and Previous April, 1971 Guidelines on the Preparation of Environmental Impact Statements

The CEQ revised NEPA guidelines issued August 1, 1973 include the following major provisions not contained in its previous April, 1971 guidelines:

1. Agencies, in terms of their particular programs, should prepare guidance on those types of actions likely to require preparation of an impact statement, and those types of actions not likely to require preparation of a statement. Guideline § 1500.6(c) For those actions likely to require preparation of a statement and those actions that may require preparation of a statement depending on the circumstances, agencies should identify what basic information needs to be gathered, how and when it is to be assembled and analyzed, and on what bases a decision whether to prepare a statement will be made. Guideline § 1500.6(c)

2. Agencies should be alert to the need to prepare, in appropriate cases, program statements and statements on a group of interrelated projects. Agencies engaging in major technology research and development programs should develop procedures for

periodic evaluation to determine when a program statement is required for such programs. Guideline § 1500.6(d)

3. Agency procedures should include an early notice system for informing the public of decisions to prepare impact statements, and include provisions apprising the public of agency determinations, in certain situations set out in the guidelines, that impact statements are not required. Guideline § 1500.6(e)

4. Agency procedures should include provisions limiting actions which an applicant is permitted to take prior to completion and review of the final statement with respect to his application. Guideline § 1500.7(a)

5. Additional guidance on when public hearings should be held is included, and agencies are called upon to set out their policies and practices on hearings. Gudeline § 1500.7(d)

6. More detailed guidance is given on the required contents of impact statements. Statements should set forth, *inter alia*, the purpose of the proposed action, the relation of the proposed action to land use plans, policies, and controls for the affected area, secondary environmental effects likely to result from the proposed action, and an indication of what other interests and considerations of Federal Policy are thought to offset the proposed action's adverse environmental effects. Agencies should consider in their impact statements, where appropriate, alternative designs or details of their proposed actions which would significantly conserve energy. Guideline § 1500.8(a)

7. Areas of environmental impact are grouped into three major categories: (1) pollution, (2) energy

supply and natural resources development, and (3) land use and land management. Each of these categories is divided into particular types of environmental impacts with respect to which agencies are requested to give special attention. Guidelines—Appendix II.

8. Agency procedures should facilitate public participation in the impact statement process. Guidelines § 1500.9(d) and 1500.11(d) Agencies should provide impact statement materials free of charge, to the extent practicable, or at a fee which is not more than the agency's actual reproduction costs. Guideline § 1500.9(d)

9. Increased guidance is given on the responsibilities of agencies in commenting on impact statements. Guideline § 1500.9(e)

10. The minimum period for review of draft impact statements is 45 days. Agencies should consider the magnitude and complexity of the statement and the extent of citizen interest in the proposed action in deciding on an appropriate comment period for a particular statement. Guideline § 1500.9(f)

11. The minimum period for review of an impact statement is calculated from the date of publication in the *Federal Register* of the Council's listing notifying the public of issuance of the impact statement. Guideline § 1500.11(c)

12. Agencies should send copies of their final statements to all parties who filed substantive comments on the corresponding draft statement. Guideline § 1500.10(b)

13. Agency NEPA procedures should ensure that the final impact statement and comments "accompany the proposal through the existing agency review

processes." Guideline §1500.11(b) In this connection agency NEPA procedures for major categories of agency action should identify what these agency review processes are. Guideline §1500.3(a)

14. Agencies shall respond to requests from the Council concerning their impact statement operations including requests for the production of either an impact statement or a negative determination that an impact statement is not necessary. Guideline §1500.11(f)

ATTACHMENT B

Provisions of the Guidelines Recommended for Agency Implementation by September 15, 1973

The Council strongly recommends that the following provisions of its new NEPA guidelines (38 *Fed. Reg.* 20550, Aug. 1, 1973) be implemented on an interim basis, no later than September 15, pending formal revision of individual agency NEPA procedures:

1. Agencies should maintain lists of their impact statements under preparation, and their determinations that certain specific proposed actions do not require the preparation of an impact statement. Guideline § 1500.6(e)

2. The minimum period for review of draft statements should be lengthened from 30 days to 45 days. The length of the review period should be calculated from the date of publication in the *Federal Register* of the Council's listing notifying the public of issuance of the impact statement. Guidelines §§1500.9(f) and 1500.11(c)

3. Agencies should endeavor to provide impact statement materials free of charge, to the fullest extent practicable, or at a fee which is not more than the agency's reproduction costs. Guideline §1500.9(d)

4. A copy of the final impact statement for a proposed action should be sent to all parties who filed substantive comments on the corresponding draft statement. Guideline § 1500.10(b)

respondent's brief

Supreme Court, U. S.
FILED
JUN 28 1977
MICHAEL RODAK, JR., CLERK

Nos. 76-419 and 76-528

In the Supreme Court of the United States

OCTOBER TERM, 1976

VERMONT YANKEE NUCLEAR POWER CORPORATION, PETITIONER

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.

CONSUMERS POWER COMPANY, PETITIONER

v.

NELSON AESCHLIMAN, ET AL.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF FOR THE FEDERAL RESPONDENTS

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In the Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION, PETITIONER

v.

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CONSUMERS POWER COMPANY, PETITIONER

v.

NELSON AESCHLIMAN, ET AL.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF FOR THE FEDERAL RESPONDENTS

OPINIONS BELOW

The opinion of the court of appeals in No. 76-419 (App. 28) is reported at 547 F. 2d 633. The opinion of the court of appeals in No. 76-528 (App. 89) is reported at 547 F. 2d 622.

JURISDICTION

The judgments of the court of appeals were entered on July 21, 1976. The petition in No. 76-419 was filed on September 21, 1976, and that in No. 76-528 on October 15, 1976. The petitions were granted and the cases consolidated on February 22, 1977. The jurisdiction of this Court rests upon 28 U.S.C. 1254 (1).

QUESTIONS PRESENTED

1. Whether rulemaking proceedings governed by and fully complying with 5 U.S.C. 553 (the applicable provision of the Administrative Procedure Act) were nevertheless defective for failure to ventilate the issues sufficiently.

2. Whether the National Environmental Policy Act requires the reopening of an agency proceeding to assess new information bearing on alleged possible alternatives, where the alleged alternatives were neither obviously central to the agency decision nor clearly identified as issues in the agency hearing.

3. Whether judicial relief is appropriate for the failure of the Commission's licensing board, *sua sponte*, to have returned to its Advisory Committee on Reactor Safeguards for further clarification that Committee's report concerning a proposed nuclear power plant.

STATUTES AND REGULATION INVOLVED

The pertinent provisions of the Administrative Procedure Act, 5 U.S.C. 551 *et seq.*, the Atomic Energy Act of 1954, 68 Stat. 919, as amended, 42 U.S.C.

2011 *et seq.*, the National Environmental Policy Act of 1969, 83 Stat. 852, as amended, 42 U.S.C. 4321 *et seq.*, and 10 C.F.R. 51.20(e) are set forth in Pet. No. 76-419 App. A-159 to A-210, A-258 to A-262.

STATEMENT

These cases involve challenges to the procedures by which the Commission [1] licenses nuclear reactors used for the production of power. The question common to both cases is the adequacy of the rulemaking proceeding that led to the promulgation of a table for use in individual reactor licensing proceedings to evaluate the environmental effects of preparing, transporting, using and ultimately disposing of the nuclear fuel required for the particular reactor Pet. No. 76-419, pp. 13-20; Pet. No. 76-528, pp. 12-16).[2]

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[1] In January of 1975 the Nuclear Regulatory Commission (NRC) succeeded to the licensing and related regulatory functions of the Atomic Energy Commission (AEC) in accordance with the Energy Reorganization Act of 1974, 88 Stat. 1233, 42 U.S.C. (Supp. V) 5801 *et seq.* (Pet. No. 76-419 App. A-211 to A-257). Throughout this brief "Commission" designates either the AEC or the NRC without further explanation, except where the distinction is important and confusion might arise.

[2] The series of steps involved is referred to as the nuclear fuel cycle or, as applied to the present generation of light-water-moderated uranium-fueled reactors, the uranium fuel cycle. It includes the mining and milling of natural uranium, uranium enrichment, the fabrication of fuel elements, the use of the fuel in the nuclear reactor, the processing of spent fuel, the transportation of the fuel to and from the reactor, and the management and disposal of radioactive wastes created at any of the previous stages.

1. The Statutory And Regulatory Scheme

The Atomic Energy Act of 1954, 42 U.S.C. 2011 *et seq.*, gave the AEC authority to develop and regulate nuclear power. The Energy Reorganization Act of 1974, 42 U.S.C. (Supp. V) 5801 *et seq.*, transferred the licensing and related regulatory functions of the AEC to the NRC in order "to more effectively address the complicated, demanding tasks of licensing nuclear plants, materials, and activities." H.R. Rep. No. 93-707, 93d Cong., 1st Sess. 4 (1973). The NRC's regulatory authority spans most of the nuclear fuel cycle.[3]

[3] The Commission has not asserted regulatory authority over uranium mining. Reprocessing and power plants are brought under the Commission's licensing authority by 42 U.S.C. 2131, which prohibits any person from operating a "production facility" or a "utilization facility" without a license from the Commission. Such facilities are defined by 42 U.S.C. 2014(aa) to include equipment capable of producing or making use of significant quantities of "special nuclear material," defined in turn as plutonium, or uranium enriched in the isotopes 233 or 235. A nuclear power reactor utilizes special nuclear material in a controlled nuclear chain reaction, which produces heat used to generate electricity. See generally 10 C.F.R. Part 50. Enrichment facilities are also production facilities, but since they are operated under contracts with the Energy Research and Development Administration they are exempt from the Commission's licensing authority (42 U.S.C. 2140(a)).

The Commission's regulatory responsibility at other stages of the nuclear fuel cycle is based on its authority over special nuclear material, source material, and by-product material, established respectively by 42 U.S.C. 2071 *et seq.*, 42 U.S.C. 2091 *et seq.*, and 42 U.S.C. 2111 *et seq.* Radioactive waste, for example, is largely "byproduct material," defined by 42 U.S.C. 2014(e) as "any radioactive material (except special nuclear material) * * * yielded in or made radioactive by exposure to

With specific regard to nuclear power plants, the Atomic Energy Act contemplates a two-stage licensing procedure: such facilities must initially obtain a construction permit, and thereafter an operating license. See generally 42 U.S.C. 2133, 2232, 2235 and 2239; *Power Reactor Co.* v. *Electricians*, 367 U.S. 396.

Under Commission regulations, the utility's application for a power plant construction permit must contain a preliminary safety analysis report, an environmental report, and information required for antitrust review. 10 C.F.R. 2.101, 50.30(f), 50.33a and 50.34(a).[4] The preliminary safety analysis re-

radiation incident to the process of producing or utilizing special nuclear material." Regulations specifically pertaining to the management of radioactive waste appear in several different parts of Title 10 of the Code of Federal Regulations.

[4] The text cites the Commission's regulations now in effect. At the time the Consumers Power construction permit hearing opened, the required environmental review was less extensive than now. Compare 10 C.F.R. Part 50, App. D, pp. 246-250 (1971) with 10 C.F.R. Part 51 (1977). After the governing regulations were invalidated in *Calvert Cliffs' Coordinating Committee, Inc.* v. *Atomic Energy Commission*, 449 F. 2d 1109 (C.A. D.C.), the Consumers Power environmental report was supplemented, and an environmental hearing conforming to the amended regulations was held. See *infra*, pp. 19-22.

The construction permit for the Vermont Yankee nuclear plant was issued December 11, 1967, long before the National Environmental Policy Act (NEPA) was passed, but NEPA requirements came into effect before the plant was licensed to operate. Pursuant to the Commission's pre-*Calvert Cliffs'* NEPA regulations, 10 C.F.R. Part 50, App. D (1971), an environmental report by the utility and an environmental impact statement by the Commission's staff were prepared prior

port contains a basic description of the design of the proposed plant, a preliminary evaluation of safety related structures, and other information relevant to the safety review performed by the Commission. 10 C.F.R. 50.34(a)(1)-(10). The utility's environmental report describes its assessment of the impact of the proposed plant and possible alternatives which would alter the impact.

The application is reviewed for consistency with the public health and safety by the Commission's staff and by the Advisory Committee on Reactor Safeguards (ACRS), a group of independent experts required by the Atomic Energy Act to review and report to the Commission on each construction permit application for the purpose of advising the Commission on "the hazards of proposed or existing reactor facilities and the adequacy of proposed reactor safety standards." 42 U.S.C. 2039; see 42 U.S.C. 2232(b). The ACRS report summarizes its review, identifies areas for further study, and recommends whether the license application should be granted. The report is made part of the record of the utility's application, 42 U.S.C. 2232(b), 10 C.F.R. 2.102(b), 50.58, as is the staff's own safety evaluation report regarding the proposed plant. These concurrent ACRS and Commission staff reviews usually take more than a year;

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to action on the operating license. Hearings on the application for an operating license took place after *Calvert Cliffs'* and, pursuant to the revised regulations, included the environmental considerations described in the text.

when they are completed, the Commission staff supplements its safety evaluation report to discuss any issues raised by the ACRS.

While these safety reports are being prepared, the Commission staff also undertakes the review processes called for by the National Environmental Policy Act (NEPA), 42 U.S.C. 4321 *et seq.* It reviews the utility's environmental report and prepares a draft environmental impact statement, which is widely circulated for comment. 10 C.F.R. 51.22-51.26. Typically, the draft statement encompasses such matters as the environmental impact of site preparation and plant construction, the impact of plant operation on land and water resources, its radiological impact on man, the need for the plant's power, and alternative sources of power such as fossil fuel plants. After the analysis of any comments received on the draft statement, the staff publishes a final cost-benefit balance for the proposed facility in a final environmental impact statement. 10 C.F.R. 51.26.

While NEPA requires in terms only that this final statement accompany the application through the decision process, since the decision in *Calvert Cliffs' Coordinating Committee, Inc.* v. *Atomic Energy Commission*, 449 F. 2d 1109 (C.A. D.C.), the Commission has considered the environmental impact as well as the health and safety of the proposed facility during the mandatory adjudicatory hearing on the application for a construction permit. 10 C.F.R. 2.743(g); see 10 C.F.R. Part 2, App. A, V(f). The three-member

Atomic Safety and Licensing Board [5] authorizes the issuance of a construction permit only if it concludes that there is reasonable assurance that the proposed facility can be constructed and operated without undue risk to the health and safety of the public, 10 C.F.R. 50.35(a), 42 U.S.C. 2241, and that the environmental cost-benefit balance favors the issuance of a construction permit. The Licensing Board's decision is appealable to an Atomic Safety and Licensing Appeal Board, and thereafter is subject to discretionary review by the Commission itself. 10 C.F.R. 2.714, 2.721, 2.787, 2.786. Final orders are directly appealable to the courts of appeals. 42 U.S.C. 2239; 28 U.S.C. 2342; *Northern Indiana Public Service Co.* v. *Porter County Chapter of the Izaak Walton League*, 423 U.S. 12; *Carolina Environmental Study Group* v. *United States*, 510 F. 2d 796 (C.A. D.C.); *Gage* v. *Atomic Energy Commission*, 479 F. 2d 1214, 1218 (C.A. D.C.).

There is a similar review process at the operating license application stage. The utility again submits a safety report, the Final Safety Analysis Report, which is reviewed and reported on by the staff and by the ACRS, 10 C.F.R. 50.34(b). The environmental review, however, merely updates the environmental review conducted at the construction permit stage, since at that stage both the utility's environmental report and the staff's final environmental impact

[5] The Licensing Board is composed of a lawyer chairman and two members with technical expertise appropriate to the issues.

statement examined the environmental impacts of the plant's operation as well as its construction, 10 C.F.R. 51.21. Moreover, unlike the mandatory hearing at the construction permit stage, the operating license hearing is held only in contested cases and may be limited to the matters in controversy. See 42 U.S.C. 2239(a); 10 C.F.R. 2.105; 10 C.F.R. Part 2, App. A, V(f). Before authorizing the issuance of an operating license in contested cases, the Licensing Board must find reasonable assurance that the activities authorized by the license can be conducted without endangering the public health and safety, and that issuance of the license will not be inimical to the common defense and security or the health and safety of the public. See 42 U.S.C. 2232(a); 10 C.F.R. 50.57(a). See generally *Union of Concerned Scientists* v. *Atomic Energy Commission*, 499 F. 2d 1069 (C.A. D.C.). The Licensing Board's decision at this stage is subject to the same review procedures as its decision on a construction permit application.

2. The Facts

a. *No. 76-419 (Vermont Yankee)*

On December 11, 1967, petitioner, Vermont Yankee Nuclear Power Corporation, was granted a permit by the Atomic Energy Commission to construct a nuclear power plant in Vernon, Vermont. 4 A.E.C. 36 (1967). Respondent Natural Resources Defense Council (NRDC) objected to the issuance of an operating license for the plant, so hearings on Vermont

Yankee's application for an operating license began on August 10, 1971. NRDC appeared in opposition to the issuance of the license. The Licensing Board excluded from consideration in the licensing proceeding, over NRDC's objection, the issue of the environmental effects of fuel reprocessing and disposal of long-lived radioactive wastes. The Licensing Board's rulings were affirmed by the Appeal Board, which reasoned that the appropriate time to consider the environmental impact of reprocessing and waste disposal was during the consideration of permits for the construction and operation of reprocessing or waste disposal facilities (App. 112-129).[6]

Some months thereafter, on November 15, 1972, the Commission gave notice that it would hold a rulemaking proceeding "that would specifically deal with the question of consideration of environmental effects

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[6] The Appeal Board noted that none of the fuel in the Vermont Yankee reactor would be replaced until after 18 months of operation, when approximately 4 percent of the fuel assemblies would be replaced. Approximately 40 percent would be replaced 12 months after that, and 25 to 30 percent every 12 months thereafter. "There is no way of ascertaining now which of the various reprocessing plants now in existence or to be constructed will from time to time receive some irradiated fuel elements from this plant for reprocessing during its estimated 40-year life. * * * [E]valuation of the environmental effects of the operation of one or more unidentifiable reprocessing plants, employing separation processes which are unidentified and which may or may not now be known or used, during the course of the forty-year life of the plant, is not possible at this time and in this proceeding" (App. 118-120).

associated with the uranium fuel cycle in the individual cost-benefit analyses for light water cooled nuclear power reactors" (App. 352).

In preparation for this hearing, the Commission's regulatory staff developed a report entitled "Environmental Survey of the Nuclear Fuel Cycle." The Environmental Survey analyzed the operation of a hypothetical light water cooled nuclear reactor of contemporary size, describing the reactor's impact on the environment at each step of the fuel cycle. App. 542, 759. This survey showed the effects to be so small that they would not significantly affect the total environmental costs imposed by an individual nuclear plant.

Two proposed alternatives were set out in the Notice of Proposed Rulemaking (App. 356-357). Under both alternatives the applicant's environmental report and the Commission's impact statements would cover in detail the storage of irradiated fuel on site and the transportation of fuel and waste to and from the reactor. Under one alternative, no quantitative consideration of the environmental costs of other off-site fuel cycle activities would be required, because the Environmental Survey had shown them to be slight. (The effects would, however, be considered in proceedings for the licensing of the fuel cycle facilities themselves.) Under the other alternative, impact values for the off-site fuel cycle environmental costs of licensing a nuclear power reactor would be specified in a table to be employed in each reactor licens-

ing hearing for whatever effect it might have on the overall cost-benefit balance.[7] The Commission invited written comments on the proposed rules and on the Environmental Survey, and announced that an informal rulemaking hearing would begin on February 1, 1973.[8]

The principal controversy before this Court in these petitions relates to the procedures employed in this hearing. The Commission first announced the procedural format in a supplemental notice of rulemaking hearing, dated December 27, 1972 (38 Fed. Reg. 49; App. 361). The procedures provided for written and oral comments, and for questioning by the Hearing Board of the participants. They did not permit discovery[9] or cross-examination by the parties. Following the hearing, the record was to be held open for 30 days to allow for the filing of supplementary written statements. The Hearing Board, without render-

[7] The proposed table of impacts, Table S-3 of the Environmental Survey, summarizes quantitatively the maximum annual effect on the environment anticipated to result from each off-site fuel cycle activity associated with the model light-water reactor (App. 358).

[8] Copies of the Environmental Survey were provided to all persons requesting them. The Commission also made available in its Public Document Room, several weeks prior to the hearings, the background studies, hand-written staff calculations, and supporting reference materials for the Environmental Survey.

[9] Nevertheless, when Consolidated National Intervenors requested documents in addition to those previously made available, they were provided. No other parties requested additional information. R. 776-779, 5369-5405. "R." refers to the agency record.

ing any decision or making any recommendation, would then forward the transcript of the hearing to the Commission, with an identification of contested issues, for the Commission's determination of an appropriate rule.

Written comments were submitted by more than forty individuals and organizations representing federal and state agencies, industry, public utilities, environmental and citizens groups, and private citizens. On January 17, 1973, the Hearing Board held a procedure planning session to schedule the appearance of witnesses and to discuss methods for compiling a meaningful record. No one at that time questioned the adequacy of the legislative-type procedural format for the hearing. R. 5645-5704.[10]

The hearing took place on February 1 and 2, with the participation of the Commission's regulatory staff, the U.S. Environmental Protection Agency, the States of New York and Minnesota, a major manufacturer of reactor equipment, a trade association for the nu-

[10] Prior to the hearings, the only suggestion that the Commission should have empowered the Hearing Board to offer more extensive procedures appears to have been made by the Sierra Club. In its comments on the Environmental Survey, received on January 27, 1973, 5 days before the scheduled hearing, the Sierra Club suggested that the proceedings should provide for discovery and cross-examination to afford the "probing review" needed to explore the environmental costs of the fuel cycle "to the full limit of our present intelligence." R. 5793; App. 757-775. These comments did not elaborate or otherwise indicate why the Commission's procedures could not be expected to produce an adequate record for rulemaking.

clear industry, a group of fourteen electric utilities, and Consolidated National Intervenors (CNI) representing 79 groups and individuals including respondent NRDC. Extensive oral testimony was presented by the Commission regulatory staff and by CNI, with shorter presentations by other participants. No evidence was excluded or limited for any reason by the Hearing Board.

Major testimony presented by the regulatory staff included statements by S. H. Smiley, Deputy Director for Fuels and Materials of the Commission's Directorate of Licensing, and by Dr. Frank Pittman, Director of the Commission's Division of Waste Management and Transportation. Mr. Smiley's statement, App. 757-775, described the methodology and conclusion of the Environmental Survey and addressed all steps in the uranium fuel cycle, including reprocessing and waste management. The Hearing Board's questioning of Mr. Smiley, following presentation of his statement, occupies 34 pages in the original transcript. App. 801-827. Dr. Pittman's statement, App. 776-799, elaborated on the high level waste management phase of the fuel cycle. Dr. Pittman described the then current Commission program for construction of a facility for storage of commercial high-level waste in sealed canisters and also described the research and development program for methods of permanent waste disposal, for example, disposal in underground salt beds. The Hearing Board questioned Dr. Pittman more briefly, asking about the safety of methods currently in use for retaining high-level

waste and the number of waste shipments associated with the annual fuel needs of the model light-water reactor. App. 829-835.

Following the hearing, and in answer to questions raised by the Hearing Board and the participants, the regulatory staff filed a supplementary document that further explained and revised the text and data of the Environmental Survey. R. 6652-6730.[11]

On July 6, 1973, the Hearing Board submitted its report to the Commission. App. 364-378. The Board identified as the principal procedural question CNI's contention that full formal adjudicatory procedures should have been used. App. 369.[12] Among substan-

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[11] The revised Environmental Survey subsequently was published as WASH-1248, Environmental Survey of the Uranium Fuel Cycle (April, 1974). This document contains Dr. Pittman's statement regarding the environmental effects of high level waste management. Table S-3 in WASH-1248 is identical to the table incorporated in the Commission's fuel cycle rule as promulgated April 17, 1974.

Extensive supplementary material was also filed by CNI, App. 1035-1057, by the Union of Concerned Scientists, App. 1067-1151, by NRDC (independently of the CNI filing), R. 6828-6842, and by the fourteen-member utility group, R. 6843-6867, among many others. See also App. 1024-1034, 1152-1153, 1155-1193.

[12] At the hearing CNI called for cross-examination with full adjudicatory procedures, App. 834, 844, but did not indicate how any specific substantive matters at the hearing might have been better developed by different procedures. In a lengthy "Statement With Respect to Legal Considerations of the Proposed Regulations on the Nuclear Fuel Cycle," App. 1035-1057, filed March 2, 1973, one month after the hearings had closed, CNI again briefly argued the desirability of cross-examination, and furnished a few examples from the hearing

tive issues, the Board identified for the Commission the question of the technical adequacy of the Environmental Survey raised by the comments and questions in the record. App. 372.

On April 16, 1974, the Commission promulgated the fuel cycle rule requiring that the environmental impacts of the uranium fuel cycle as specified in the rule by means of Table S-3 be included in the NEPA analysis for individual nuclear power plants (App. 385-400; 39 Fed. Reg. 14188).[13] As to the procedural issue the Commission stated (App. 389-390; footnote omitted):

> In our view, the procedures adopted provide a more than adequate basis for formulation of the rule we adopted. All parties were fully heard. Nothing offered was excluded. The record does not indicate that any evidentiary material would have been received under different procedures. Nor did the proponent of the strict "adjudicatory" approach make an offer of proof—or even remotely suggest—what substantive matters it would develop under different procedures. In

showing how, in CNI's view, adversarial questioning more persistent than the Hearing Board's might have improved the record. App. 1054, 1055. None of these examples was specifically directed to waste management or reprocessing issues.

[13] The numerical values in Table S-3 are not open to challenge in proceedings to license individual nuclear power plants. The Licensing Board must use those values in striking the environmental cost-benefit balance as part of its determination whether a license should be issued. See *Potomac Electric Power Company*, 8 A.E.C. 79 (1974).

> addition, we note that all documents including the Survey were available to the parties several weeks before the hearing, and the Regulatory staff, though not requested to do so, made available various drafts and handwritten notes. Under all of the circumstances, we conclude that adjudicatory type procedures were not warranted here.

Regarding the adequacy of the record, the Commission reviewed the information presented at the hearing, including the discussion of high level waste management, and concluded that "the Survey and hearing record provide an adequate data base for the regulation adopted." App. 392.

The rule was made prospective only; the impacts quantified in the rule were therefore not included in the NEPA analysis for Vermont Yankee's operating license, which had been issued on February 28, 1973.[14]

b. *No. 76-528 (Consumers Power)*

On January 13, 1969, petitioner Consumers Power Company applied for a permit to construct the Midland plant. The application was initially examined by the Commission's regulatory staff and by the Advisory Committee on Reactor Safeguards. The ACRS issued its report on June 18, 1970, and a supple-

[14] Had the rule been made applicable to the Commission's *Vermont Yankee* proceeding, it is unlikely that the result would have been changed. In the notice promulgating the fuel cycle rule the Commission observed that "the environmental effects of the uranium fuel cycle have been shown to be relatively insignificant" (App. 395).

mental report on September 23, 1970. R. 2611, 2617. Both discussed specific problems and recommended solutions. In addition, the former concluded (R. 2615-2616):

> Other problems related to large water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee believes that resolution of these items should apply equally to the Midland Plant Units 1 & 2.
>
> The Committee believes that the above items can be resolved during construction and that, if due consideration is given to these items, the nuclear units proposed for the Midland Plant can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public.

Following completion of the review, the Commission scheduled public hearings before a Licensing Board on the radiological health and safety issues connected with the application. 42 U.S.C. 2239(a). Two groups —Saginaw and Mapleton—intervened in opposition to the application.[15]

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[15] These two groups are respondents seeking affirmance of the opinion below in No. 76-528.

The Saginaw group includes: the Saginaw Valley Nuclear Study Group, the Citizens Committee for Environmental Protection of Michigan, the Sierra Club, the United Auto Workers International, the West Michigan Environmental Action Council, and the University of Michigan Environmental Law Society.

The Mapleton group includes Nelson Aeschliman and five other residents of the community of Mapleton, Michigan, who filed a separate petition in intervention. The Mapleton intervenors did not raise any objection even arguably relating to energy conservation.

Before the hearing, the Saginaw respondents filed with the Board a number of environmental contentions, R. 2455-2460, directed 337 interrogatories to the ACRS, R. 4661-4725, applied for subpoenas to depose the chairman of the ACRS, R. 8270, and requested discovery of various ACRS documents, R. 3683, 4723. Under the Commission's then existing NEPA regulations, environmental issues could not be raised at the hearing, and the Licensing Board excluded the contentions relating to such issues from consideration. The Licensing Board also denied the various discovery requests directed to the ACRS.[16]

During June and July of 1971, 17 days of hearings were held on numerous radiological health and safety issues. On the last day of the hearings, the decision in *Calvert Cliffs' Coordinating Committee, Inc.* v. *Atomic Energy Commission*, 449 F. 2d 1109 (C.A. D.C.), invalidated the Commission's NEPA regulations; accordingly, the Commission revised its regulations and undertook a full environmental review of the proposed Midland reactor.

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[16] Discovery was denied on the grounds that it would impair the Committee's function, that the Licensing Board would not rely on ACRS conclusions regarding the safety of the reactor, and that the ACRS was not a party to the proceeding (R. 7524-7525, 7615A, 8482-8487).

In accordance with the new regulations,[17] Consumers Power filed a 1400-page environmental report, subsequently amended in response to staff questions. R. 12612, 15697, 16044, 16293. The staff then conducted its own environmental evaluation of the proposed plant. In January 1972, the staff draft environmental statement (R. 16152-16292) and the applicant's environmental report were issued for public comment. Comments were received from eight federal agencies, two local governmental bodies, two business associations, a municipal utility, and four environmental groups. Saginaw submitted 119 environmental contentions both as comments on the draft statement and as its position in the forthcoming hearing (App. 1340).[18] Based on the comments received, the staff extensively revised the draft; it issued a final environmental statement (FES) in

[17] 36 Fed. Reg. 18071; see 10 C.F.R. Part 50, App. D (1972).

[18] Three of the 119 contentions mentioned energy conservation (App. 1383-1384); others simply contended that the Board must examine whether the end uses of electricity from the proposed plant would be socially or environmentally proper or improper (*e.g.*, App. 1356-1362, 1378-1380). For the most part, the Licensing Board either noted these contentions for consideration at the hearing or invited Saginaw to brief them as legal issues at the appropriate time. Prehearing Order with respect to Environmental Issues, R. 17336. The Licensing Board's order did exclude from consideration at the hearing those aspects of the environmental effects of the nuclear fuel cycle that were excluded from the *Vermont Yankee* proceeding, and the Appeal Board affirmed (App. 173-183).

March 1972 (R. 17353-17722).[19] The Commission then scheduled environmental hearings on the Midland application, which were held for 14 days during May and June of 1972. Saginaw did not appear or otherwise participate in the hearings;[20] instead, it filed a sharply worded critique of the proceedings, stating that as to environmental issues it had "no conventional findings of fact to set forth," and as to radiological issues, it had not "chosen to search the record and respond to this proceeding by submitting

[19] The FES extensively described the project and thoroughly discussed its environmental impacts. FES at II-1 to VII-3, R. 17376-17499. It also discussed a number of alternatives to the applicant's proposal. They included the need for power (implicitly considering the alternative of not building any plant), alternate sources of power (including a coal-fired steam plant, an oil-fired steam plant, and an oil-fired combined cycle plant), alternate sources of process steam (including oil and coal-fired boilers), alternate sites for the plant, alternate cooling systems (including the proposed pond system, dry cooling towers, and natural and mechanical draft wet cooling towers), as well as several other alternatives. FES at X-1 to XI-11, R. 17503-17515. The discussion compared the environmental impacts and technological advantages and disadvantages of the alternatives with those of the proposed plant. In addition, there was a detailed cost-benefit comparison, in narrative and chart form, of alternate sources of power. The statement concluded that construction permits should issue, provided that the applicant took certain specific steps to protect the environment. FES at iii, R. 17358.

[20] Saginaw's counsel deemed his presence indispensible to the Commission's then pending rulemaking on emergency core cooling systems. Efforts were made to accommodate the Midland hearings to Saginaw's counsel's schedule, but to no avail. Prehearing conference of April 28, 1972, R. 17855-17888.

citations of matters which we believe were proved or disproved." Saginaw Valley *et al.* Intervenors' Proposed Findings of Fact and Conclusions of Law, R. 22886, 22888, 22892.

In its initial decision, the Licensing Board noted (App. 190 n. 10):

> [T]he failure to propose proper findings and conclusions has greatly complicated the task of the Board and has made it virtually impossible in some instances to know whether particular issues are in fact contested.

The Board nevertheless treated as contested issues "those as to which intervenors introduced affirmative evidence or engaged in substantial cross examination" (App. 191). It expressly recognized its duty to "independently consider the final balance among conflicting environmental factors in the record" (App. 205), and discussed numerous environmental issues, including the need for power and alternative sources of power. It concluded that Consumers' application satisfied the requirements of the Atomic Energy Act and NEPA, and therefore authorized the issuance of construction permits, subject to certain conditions to protect the environment (App. 217-222).[21]

[21] On December 18, 1972, a few days after the issuance of the initial decision, the ACRS transmitted to the Chairman of the Commission a list of generic safety concerns, which the ACRS identified as the "other problems" mentioned in its earlier reports on the Midland plant and other individual facilities. R. 24389-24395. The letter listed 25 items as resolved to the satisfaction of the ACRS. The other 22 items remained unresolved, and the ACRS indicated that it would continue to consider them on a case-by-case basis until a generic resolution was reached. R. 24390. Respondents introduced this letter into the record of the proceeding (R. 24385-24388).

The Appeal Board affirmed the Licensing Board's order, subject to Consumers' fulfillment of certain conditions not relevant here. App. 254-321. When the Commission declined review, the Appeal Board's decision became the final decision of the Commission. Saignaw petitioned the court of appeals for review of the Commission decision on August 9, 1973.

At approximately the same time, the Council on Environmental Quality (CEQ) revised its guidelines for the preparation of environmental impact statements (38 Fed. Reg. 20550), mentioning energy conservation for the first time. The revised guidelines applied to final impact statements filed after January 28, 1974 (38 Fed. Reg. 20550, 21265).

On November 6, 1973, more than one year after the record had closed in the Midland case, and while the case was before the court of appeals, the Commission issued an order in an unrelated case, *Niagara Mohawk Power Corp.*, ruling that the *Niagara* Licensing Board could not, consistent with NEPA, bar at the threshold evidence on possible energy conservation alternatives (Pet. No. 76-528, App. 252). Saginaw thereupon filed a motion requesting the Commission to reopen the Midland proceedings and to clarify the Midland decision in light of the *Niagara* ruling.[22]

[22] The court of appeals delayed briefing on the petition for review in order to allow the Commission to consider this motion.

On January 24, 1974, the Commission carefully examined Saginaw's contentions and refused to reopen the Midland proceedings. App. 324-345. It decided that it was inappropriate to apply the *Niagara* decision retroactively in "the unfolding area of energy conservation" in light of the reliance of the parties on past practice and the consequent burdens that would result from a retroactive application of the new rule (App. 337). The Commission also contrasted the specific contentions made by the *Niagara* intervenors with Saginaw's "diffuse barrage" (App. 334) of 119 contentions containing 17 objections Saginaw identified for the first time in its motion for clarification as relating to energy conservation.[23] In clarification of the *Niagara* order, the Commission asserted (App. 331-332; citations and footnote omitted):

> It would be neither possible nor desirable for us to lay down, at least at this juncture, very precise guidelines governing the kinds of energy conservation issues which should be allowed in licensing proceedings. Widely varying factual circumstances in individual cases, coupled with the inherent generality of the "energy conservation" concept, dictate that such guidelines be developed on a case-by-case basis, or, perhaps,

[23] The 17 objections are identified in Saginaw's "Motion to Clarify ALAB-123", dated November 20, 1973 (R. 25121-25134), as contentions 31-34 (App. 1356-1359), 47 (App. 1366-1367), 49 (App. 1367-1368), 72-76 (App. 1378-1380), 81 (App. 1382), 85 (App. 1383), 87-89 (App. 1383-1384), and 92 (App. 1385).

> through rulemaking. Nevertheless, certain basic considerations can be stated from the present vantage point. Purported energy conservation issues must meet a threshold test—they must relate to some action, methods or developments that would, in their aggregate effect, curtail demand for electricity to a level at which the proposed facility would not be needed. * * * Beyond that, the issue must pertain to an alternative that is "reasonably available." Furthermore, the impact of proposed energy conservation alternatives on demand must be susceptible to a reasonable degree of proof. Largely speculative and remote possibilities need not be weighed against a convincing projection of demand. Here, as with many other issues under the National Environmental Policy Act of 1969, a rule of reason applies.

The Commission noted that, in contrast to the *Niagara* Licensing Board's refusal to consider evidence relating to energy conservation, the Midland Board had invited Saginaw to present evidence concerning or discuss the legal issues relating to substantially all 17 of the contentions it later identified as involving energy conservation,[24] that Saginaw had failed to do so, and that the record supported the Board's ultimate rejection of each contention (App. 334-341).

[24] The Commission found that the Board properly refused to consider contentions challenging the social utility of several of the proposed uses of the electricity to be generated (App. 334, 337-339).

The Commission recognized that NEPA "imposes upon [the agency] an affirmative obligation to develop an adequate record upon which to assess the environmental impact of proposed nuclear plants" (App. 343). But it also emphasized that "energy conservation is a novel and evolving concept" (App. 344). Therefore, although after *Niagara* it was to be the responsibility of the applicant, the staff, and the Board to assure that the record on energy conservation issues is adequate whether or not intervenors raise those issues, the *Niagara* rule would not be applied retroactively. At the time of the Midland hearing, it was proper to require the intervenors to formulate their suggestions with some specificity, and to indicate how the suggested alternatives would affect the cost-benefit analysis. The Commission required, however, only that the intervenors' suggestions be "sufficient to require reasonable minds to inquire further" (*id.* at n. 27). Since Saginaw "fell far short" of making even this showing, there was no need to reopen the hearing for further review of its contentions (App. 344).

3. The Decisions of the Court of Appeals

a. *No. 76-419 (Vermont Yankee)*

Separate petitions for review were filed by respondents challenging the granting of the Vermont Yankee operating license without consideration of the environmental effects of the entire nuclear fuel cycle, and the adequacy of the rulemaking proceeding underly-

ing the fuel cycle regulation. The court of appeals consolidated the cases for argument and held that the Commission had improperly issued the Vermont Yankee operating license without evaluating the environmental effects of its entire fuel cycle, either in that case or in a valid rule. The court recognized that under NEPA the agency was free to consider these environmental effects either in individual licensing proceedings or in the course of generic rulemaking (App. 39-40 n. 17). Since the Commission had elected to proceed by rulemaking, the court remanded the order granting the Vermont Yankee operating license "to await the outcome of further proceedings in the rulemaking" (App. 40).[25]

In considering the adequacy of the rulemaking proceeding, the court noted that the primary argument advanced by the parties seeking review was "that the decision to preclude 'discovery or cross-examination' denied them a meaningful opportunity to participate in the proceedings as guaranteed by due process"

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[25] Petitioner Vermont Yankee intervened in the proceeding involving the challenge to the issuance of its license (App. 1), but not in the proceeding challenging the rulemaking (App. 6-7). The certiorari petition filed by Baltimore Gas and Electric, *et al.*, intervenors in the latter proceeding, is currently pending before this Court (No. 76-548), and they are participating as respondents in this case. Since the court of appeals consolidated the cases and remanded the order granting Vermont Yankee's license to await further proceedings in the rulemaking proceedings, we submit that the validity of the rulemaking proceedings is properly before this Court in No. 76-419 as it is in No. 76-528, where the decision also turned in part on the validity of the rulemaking procedures.

(App. 43). In contrast, the government "contends that the procedures here were more than adequate. Thus, we are called upon to decide whether the procedures provided by the agency were sufficient to ventilate the issues" (App. 44).

After reviewing the state of the record on waste disposal,[28] the majority concluded that while it did not dispute the conclusions of the Commission's principal witness, Dr. Pittman, "[w]e may not uphold them, however, lacking a thorough explanation and a meaningful opportunity to challenge the judgments underlying them. Our duty is to insure that the reasoning on which such judgments depend, and the data supporting them, are spread out in detail on the public record" (App. 61). The majority did not explicitly designate the procedures necessary in its view to insure preparation of such a detailed record. Rather, it simply noted (App. 67):

> Many procedural devices for creating a genuine dialogue on these issues were available to the agency—including informal conferences between intervenors and staff, document discovery, interrogatories, technical advisory committees comprised of outside experts with differing perspectives, limited cross-examination, funding independent research by intervenors, detailed annotation of technical reports, surveys of existing literature, memoranda explaining methodology. We do not presume to intrude on the agency's province by dictating to it which, if any, of these devices it must adopt to flesh out the record. It may be that no combination of the procedures mentioned above will prove adequate, and the agency will be required to develop new procedures to accomplish the innovative task of implementing NEPA through rulemaking. On the other hand, the procedures the agency adopted in this case, if administered in a more sensitive, deliberate manner, might suffice. * * *

[28] Although the court found the fuel cycle rule inadequate with regard to both waste disposal and reprocessing, the court's opinion focused almost entirely on waste disposal, and in particular on Dr. Pittman's statement. See *supra*, pp. 14-15. The court did not offer any explanation for its conclusion that the rulemaking record on fuel reprocessing was inadequate.

Judge Tamm, concurring in the result, agreed with the majority that NEPA required consideration of the environmental impact of radioactive wastes prior to approval of an operating license for a nuclear power plant. Further, he was of the view that the record did not clearly show whether the Commission had properly concluded that the impact of those wastes was negligible, or had uncritically accepted the testimony of its staff witness. However, in Judge Tamm's view (App. 83-84):

> [T]he majority's insistence upon increased adversariness and procedural rigidity, uneasily combined with its non-direction toward any specific procedures, continues a distressing trend toward over-formalization of the administrative decisionmaking process which ultimately will impair its utility.
>
> * * * * *

> The appropriate remedy at this point is not to impose ad hoc procedural requirements in an attempt to raise the level of petitioners' participation, already adequate under section 553, but to remand for an explanation of the basis of Dr. Pittman's statements and of the staff's numerical conclusions * * *.

Following the court of appeals' decision, the Commission announced that it interpreted the court of appeals' opinion as requiring a suspension of many of its power reactor licensing activities pending an adequate replacement for the invalidated portion of the rule. The Commission also directed the preparation on an expedited basis of a revised environmental survey to supplement the existing record on the environmental effects of waste management and fuel reprocessing, and, if warranted, to serve as the basis for an interim fuel cycle rule to be promulgated by notice and comment procedures (41 Fed. Reg. 34707). Two months later, the Commission released the revised survey for public comment and gave notice that, pending the adoption of a final rule, it proposed to use a table of environmental impacts taken from the revised survey as a substitute for the values in Table S-3 of the original fuel cycle rule (Pet. No. 76-419, Supplemental App. SA-5; 41 Fed. Reg. 45849).[27]

[27] We are lodging a copy of the revised survey and subsequent analysis of public comments with the Clerk of this Court. "Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0116 (October 1976); "Public Comments and Task Force Responses Regarding the Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0216 (March 1977). The survey drew on data and analysis in more than 175 reports and papers in the public literature, as well as waste generation and reprocessing information in the Commission's recently issued report, "Final Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors: Health, Safety and Environment," NUREG-0002 (August 1976).

On October 8, 1976, the court of appeals stayed its mandate. The Commission thereupon issued a supplement to its announcement suspending licensing; taking account of the stay of mandate and the information in the revised evironmental survey, the Commission provided for a conditional resumption of the licensing of nuclear plants (Pet. No. 76-419, Supplemental App. SA-20; 41 Fed. Reg. 49898).

On March 14, 1977, after receipt and analysis of public comments on the revised survey, the Commission promulgated an interim fuel cycle rule. 42 Fed. Reg. 13803.[28] The Commission found that the values in the revised Table S-3 incorporated in the interim rule are not sufficiently different from the values in the original Table S-3 to warrant reopening proceedings to reconsider the cost-benefit balance for previously licensed reactors.[29]

On May 26, 1977, the Commission gave notice that it proposed to adopt the interim rule as the final rule, and announced that a legislative-type hearing, with somewhat more elaborate procedures than those orig-

[28] This rule has been challenged in *Natural Resources Defense Council, Inc.* v. *Nuclear Regulatory Commission*, C.A. D.C., No. 77-1448, filed May 13, 1977.

[29] The interim rule will be effective only for eighteen months, pending completion of final rulemaking proceedings.

inally utilized, was to begin on a schedule set by its Hearing Board (42 Fed. Reg. 26987).[30]

b. *No. 76-528 (Consumers Power)*

The same day the court of appeals decided *Vermont Yankee*, it also rendered its decision in *Aeschliman* v. *Nuclear Regulatory Commission*, App. 89. It noted that *Vermont Yankee* controlled the fuel cycle issues in this case, and required a remand for reconsideration of the environmental impact of the nuclear fuel cycle of the Midland reactors (App. 109).[31]

With regard to energy conservation, the court found the Commission's "threshold test" inconsistent with the basic mandate of NEPA that agencies must take the initiative in considering environmental issues. It concluded that the test improperly placed on intervenors the entire burden of compiling the information necessary to determine whether the alternative presented was promising enough to merit detailed consideration in the environmental impact statement, and "essentially require[d] intervenors to prove an alternative satisfie[d] the 'rule of reason' before the Commission [would] investigate it" (App.

[30] The Commission has invited the participants in the proceeding to suggest questions and follow-up questions for the Board to ask witnesses at the re-opened hearing, and expressed its expectation that this procedure will be used in a thorough and probing manner.

[31] The Midland construction permit was issued before the effective date of the fuel cycle rule; in *Vermont Yankee*, the court rejected the Commission's decision not to apply the fuel cycle rule retroactively (App. 39-40 n. 17).

100). The court found that Saginaw's contentions were sufficient to require further Commission consideration of energy conservation because they "identified in a general way the measures [Saginaw] believed merited consideration" (App. 102)[32] and because energy conservation "was clearly a 'colorable' alternative" (*ibid.*).

Turning to intervenors' objections to the ACRS report, the court of appeals analyzed the legislative history of the statutory provision requiring that such report be made public (42 U.S.C. 2232(b)), and concluded that Congress intended the report both to advise the Commission and to inform the public (App. 106-108). While the reference in the ACRS report on the Midland reactors to other problems identified in previous reports may have sufficiently fulfilled the first purpose, the court concluded, it was inadequate for the second (App. 107-108). The court agreed with the Commission that intervenors were not entitled to discovery from individual ACRS members, since such inquiries would compromise the essential collegial and advisory character of that body (App. 106); but the court held that "[o]n remand, the ACRS report should be returned to the ACRS for clarification" (App. 109), although such a remedy had neither been requested by intervenors nor established in Commission practice.

[32] The court found that it "need not decide what the result would be if energy conservation had not been brought to the Licensing Board's attention" (App. 94 n. 6).

SUMMARY OF ARGUMENT

Although the opinion below in No. 76-419 is not entirely clear, we assume for purposes of this brief that the court decided that the agency proceeding that led to the Commission's fuel cycle rule was procedurally inadequate. But that proceeding, which was subject to the informal rulemaking requirements of the Administrative Procedure Act (APA), fully complied with those requirements: it provided interested persons with notice, an opportunity to participate in the rulemaking, and a statement of the basis of the rule adopted, 5 U.S.C. 553. No more was required. Neither the legislative history of the APA nor this Court's decisions support the judicial imposition of additional procedural requirements on informal agency rulemaking. No significant issues in the interpretation of the National Environmental Policy Act are here involved.

Moreover, the determination, long after the conclusion of the rulemaking proceedings, that additional procedures should have been used, although no such procedures are required by the Constitution, any statute, or even any clearly articulated standards of administrative law, tends to obstruct the functioning of the rulemaking process. In order to avoid possible invalidation of rules that may be central to the regulatory process, agencies would be encouraged to utilize full adjudicatory procedures for the adoption of rules, whatever the cost in terms of efficiency.

Similarly, the court of appeals' decision in No. 76-528 imposes unwarranted burdens on the agency in the preparation of environmental impact statements.

Instead of simply insuring that the agency "has taken a 'hard look' at environmental consequences," *Kleppe* v. *Sierra Club*, 427 U.S. 390, 410, the court below required the agency to undertake an investigation of every "colorable alternative" raised by the intervenors and to explain in the impact statement the reason for the rejection of each such alternative (App. 100-101). In determining that the possibility of effective conservation of energy was a "colorable alternative" to the construction of the Midland facility, the court of appeals viewed the 1972 licensing proceeding from the perspective of 1976, after the Arab oil embargo and energy shortages brought the energy crisis to national attention. Petitioners' vague and unfocused comments on the draft environmental impact statement were insufficient in 1972 to direct the Commission's attention to this novel issue, which was peripheral to the questions of public health and safety with which the licensing proceeding was chiefly concerned.

Finally, the conclusion of the court of appeals in No. 76-528 that the Licensing Board should, *sua sponte*, have returned the report on the Midland facility of the Commission's Advisory Committee on Reactor Safeguards to the Committee for clarification, misconceives the function of the Committee and threatens to interfere with the Committee's important function of advising the Commission on highly technical matters relating to the safety of reactors. In any event, the record demonstrates that any possible ambiguity in the original report was subsequently resolved, and thus there was no need to return the report to the Committee for clarification.

ARGUMENT

I. THE RULEMAKING PROCEEDING WAS ADEQUATE

It is open to dispute whether the decision of the court of appeals in *Vermont Yankee* is based on the conclusion that the Commission's rulemaking *procedures* were inadequate, or whether it simply concluded that the *record* upon which the Commission relied in promulgating its rule was inadequate. Compare App. 44, with App. 49-50 and App. 65-69; and compare App. 72-77 (separate statement of Chief Judge Bazelon) with App. 78-86 (separate statement of Judge Tamm, concurring in the result).[33]

If this Court were to read *Vermont Yankee* as holding only that the record on which the agency acted in promulgating its rule was inadequate to support its finding quantifying the environmental effect of radioactive waste disposal and reprocessing, no significant question for review by this Court would be presented.[34] Such a holding would have no serious

[33] The separate statements of Judges Bazelon and Tamm make it clear that Chief Judge Bazelon takes the former position and Judge Tamm the latter.

[34] So interpreted, the opinion, even if erroneous, does not overstep the established bounds for judicial review of agency action. *Federal Power Commission* v. *Transcontinental Gas Pipe Line Corp.*, 423 U.S. 326, 331; *Camp* v. *Pitts*, 411 U.S. 138, 142; *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402. Even the presence of highly technical and specialized material in the record does not relieve the reviewing court of its obligation to adjudicate a challenge to the adequacy of the record. *Ethyl Corp.* v. *Environmental Protection Agency*, 541 F. 2d 1, 35 (C.A. D.C.).

adverse effect on agency functions. Although the Commission does not concede that the record before the court of appeals in *Vermont Yankee* was in any way inadequate,[35] much additional information has since been developed in the revised environmental survey, so that the factual setting now is significantly altered from that before the court of appeals.[36]

If, on the other hand, the court below held that the Commission's rulemaking proceeding was procedurally defective, the decision conflicts sharply with both the Administrative Procedure Act and NEPA, and threatens to inhibit significantly agency efforts to develop flexible, expeditious procedures appropriate to the particular rulemaking involved. See Wright, *The Courts And The Rulemaking Process: The Limits Of Judicial Review*, 59 Cornell L. Rev. 375, 387-388 (1974). Since this Court's grant of certiorari in this case without limitation may be interpreted as indicating that the decision may be so interpreted,[37] the

[35] Indeed, on the reprocessing issue, the court of appeals completely failed to explain why it considered the record insufficient.

[36] The Commission intends to complete the rulemaking proceedings currently in process even if petitioners prevail in this case.

[37] The government's brief on the petitions for certiorari (pp. 5-10) expressed the differing views of the Commission and the United States on this matter. In opposing certiorari, respondents Aeschliman *et al.*, Natural Resources Defense Council, and Consolidated National Intervenors explicitly stated their view that the decision involved only a determination that the record developed by the agency was substantively inadequate. Respondents' Brief in Opposition in No.

remainder of the discussion herein will be directed toward that interpretation.

A. The Commission's Rulemaking Procedures Complied With The Administrative Procedure Act.

The Administrative Procedure Act (APA), 5 U.S.C. 551 *et seq.*, defines two types of rulemaking. One, described in 5 U.S.C. 553, involves three steps: first, an agency must give adequate and effective notice of the proposed rule (5 U.S.C. 553(b)); second, it must give interested persons an opportunity to participate in the rulemaking "through submission of written data, views, or arguments with or without opportunity for oral presentation" (5 U.S.C. 553(c)); and third, the agency must incorporate in the rules adopted a "concise general statement" of the basis and purpose for the rule (*ibid.*). See *United States* v. *Allegheny-Ludlum Steel Corp.*, 406 U.S. 742, 758; *Home Box Office, Inc.* v. *Federal Communications Commission*, C.A. D.C., No. 75-1280, decided March 25, 1977, slip op. 49-52. The second type of rulemaking, necessary "[w]hen rules are required by statute to be made on the record after opportunity for an agency hearing" (5 U.S.C. 553(c); see 5 U.S.C. 559), involves proceedings more closely analogous to a trial; in such a hearing a party is entitled

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76-419, pp. 2-5, 9-11; Respondents' Brief in Opposition in No. 76-528, pp. 52-53. See also Respondents' Brief in Opposition in No. 76-548, pp. 13-20.

to "conduct such cross-examination as may be required for a full and true disclosure of the facts" (5 U.S.C. 556(d)).

The rulemaking proceeding provided here complies with Section 553 (App. 79-80, Tamm, J., concurring; see also App. 42-44, 67 n. 59), and an adjudicatory type hearing was not mandated, since neither the Atomic Energy Act of 1954 (AEA), 42 U.S.C. 2011 *et seq.*, nor the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. 4321 *et seq.*, nor any other statute requires rules of this type to be made on the record after opportunity for a hearing.[38] Although Section 189(a) of the Atomic Energy Act of 1954 (42 U.S.C. 2239(a)) requires that the Commission grant "a hearing" on the request of any person potentially affected by rulemaking dealing with the activities of licensees, it is settled that such statutory language means only that a notice and comment hear-

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[38] Nor does the Constitution. Respondents evidently claimed below that the Commission's rulemaking procedures denied them due process (App. 43). But the decision below did not rest on constitutional grounds (see, *e.g.*, App. 45, 48, 69, 78 (concurring opinion)), and respondents have evidently abandoned these claims in this Court (see briefs in opposition to petitions for certiorari, *supra*, note 37.) In any event, it is well settled that the Constitution does not require more elaborate procedures than those provided here. See *United States* v. *Florida East Coast Railway Co.*, 410 U.S. 224, 244-245; *Bowles* v. *Willingham*, 321 U.S. 503; *Bi-Metallic Investment Co.* v. *State Board of Equalization*, 239 U.S. 441; *Pickus* v. *United States Bd. of Parole*, 543 F. 2d 240, 244 (C.A. D.C.); *California Citizens Band Association* v. *United States*, 375 F. 2d 43, 50 (C.A. 9), certiorari denied, 389 U.S. 844.

ing conforming to Section 553 is necessary, and a full adjudicatory hearing pursuant to Section 556 is not required. *Siegel* v. *Atomic Energy Commission*, 400 F. 2d 778, 785-786 (C.A. D.C.); *United States* v. *Allegheny-Ludlum Steel Corp.*, 406 U.S. 742, 757; *United States* v. *Florida East Coast Railway Company*, 410 U.S. 224, 237, 238, 241; *Federal Power Commission* v. *Texaco*, 377 U.S. 33, 44-45. See 42 U.S.C. 2231; 5 U.S.C. 559.

Nor did NEPA require the use in the Commission's rulemaking proceeding of procedures more elaborate than those indicated by Section 553. NEPA directs federal agencies to (42 U.S.C. 4332(2)(A)):

> utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment.

The statute nowhere suggests that such an approach requires that all agency rules even remotely affecting the environment must be made on the record after an opportunity for a hearing. Although an environmental impact statement must be included in every recommendation or report on "major Federal actions significantly affecting the quality of the human environment" (42 U.S.C. 4332(2)(C)), the statute does not define any hearing procedures to be followed in developing such statements or otherwise purport

to revise normal agency rulemaking procedures."[39] In any event, as the court of appeals recognized, the Commission's rulemaking proceeding that led to the adoption of Table S-3 was not "a 'major Federal action' requiring an environmental impact statement" (App. 66 n. 58). *A fortiori*, there was no necessity under NEPA to conduct an adjudicatory type hearing.

The legislative history of the APA and this Court's decisions establish that Section 553 reflects a balancing of the need for essential procedural safeguards against the need to permit agencies maximum flexibility in dealing with their particular responsibilities. Accordingly, once it is established that a rulemaking proceeding governed by Section 553 complies with that Section, the courts are not free to require the agency to provide more elaborate procedures. In such a case, Congress has left to agency discretion the decision whether the procedures required by Section 553 are sufficient for the particular type of hearing, or, if not, precisely what additional procedures will best assist the agency in considering the proposed rule.[40]

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[39] See *Natural Resources Defense Council, Inc.* v. *United States Nuclear Regulatory Commission*, 539 F. 2d 824, 838 (C.A. 2), certiorari granted on other grounds, March 28, 1977 (No. 76-653); *Scenic Rivers Association* v. *Lynn*, 520 F. 2d 240, 246 (C.A. 10), reversed on other grounds, 426 U.S. 776; *Lathan* v. *Brinegar*, 506 F. 2d 677, 689 (C.A. 9); *Jicarilla Apache Tribe of Indians* v. *Morton*, 471 F. 2d 1275, 1284-1287 (C.A. 9); cf. *Kleppe* v. *Sierra Club*, 427 U.S. 390, 406.

[40] Congress has recently demonstrated that when it does not intend such decisions to be left to agency discretion, it will specifically require the use of "hybrid" procedures in in-

The legislative history of the Administrative Procedure Act reflects Congress' concern to devise a uniform code of procedures for agency action that would satisfy basic considerations of fairness. The House Report noted (H.R. Rep. No. 1980, 79th Cong., 2d Sess. 9, 16-17 (1946)):

> [U]niformity has been found possible and desirable for all classes of both equity and law actions in the courts * * *. It would seem to require no argument to demonstrate that the administrative agencies, exercising but a fraction of the judicial power[,] may likewise operate under uniform rules of practice and procedure and that they may be required to remain within the terms of the law as to the exercise of both quasi-legislative and quasi-judicial power.
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> * * * * *
>
> The bill is an outline of minimum essential rights and procedures. * * * It affords private parties a means of knowing what their rights are and how they may protect them * * *.
>
> * * * [The bill states] the essentials of the several forms of administrative proceedings * * *.

Congress was equally clear in its intent that, absent other statutory direction, agency rulemaking

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formal rulemaking. The Federal Trade Commission Improvements Act, 88 Stat. 2193, 15 U.S.C. (Supp. V) 57a, introduced in 1975 the first statutory requirements for oral hearings, with certain limited rights of cross examination, for FTC informal rulemaking otherwise governed by 5 U.S.C. 553. In 1976, the Toxic Substances Control Act, Pub. L. 94-469, 90 Stat. 2020-2023, introduced similar procedures into rulemaking to be conducted by the Administrator of the Environmental Protection Agency.

need only provide the procedural protections of notice and comment as required by Section 553, unless the agency itself determines that additional procedures should be offered. Thus the Senate Report explains Section 4(b) (now 5 U.S.C. 553(c)) as follows (S. Rep. No. 752, 79th Cong., 1st Sess. 14-15 (1945)):

> This subsection states * * * the minimum requirements of public rule making procedure short of statutory hearing. Under it agencies might in addition confer with industry advisory committees, consult organizations, hold informal "hearings," and the like. Considerations of practicality, necessity, and public interest * * * will naturally govern the agency's determination of the extent to which public proceedings should go. Matters of great import, or those where the public submission of facts will be either useful to the agency or a protection to the public, should naturally be accorded more elaborate public procedures."[41]

This repeated reference to "minimum procedures" and "minimum requirements" indicates that Congress intended that such procedures afford all the protection that an agency may be compelled to offer private parties as of right absent other congressional or constitutional requirements. See 5 U.S.C. 559.

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[41] Accord, *The Attorney General's Manual on the Administrative Procedure Act* 31, 35 (1947), a contemporaneous interpretation, persuasive because of the role of the Department of Justice in drafting and administering the statute. See *United States* v. *Zucca*, 351 U.S. 91, 96; *Power Reactor Co.* v. *Electricians*, 367 U.S. 396, 408.

This Court's first major decision interpreting the Administrative Procedure Act reflected this understanding that the Act was intended to specify minimum procedures of administrative fairness uniform to federal agencies. After reviewing the history of the development of the APA in *Wong Yang Sung* v. *McGrath*, 339 U.S. 33, 36-41, the Court concluded (*id.* at 40):

> The Act thus represents a long period of study and strife; it settles long-continued and hard-fought contentions, and enacts a formula upon which opposing social and political forces have come to rest.

Having thus settled on the APA as a "formula" to reconcile agency needs with other public concerns, Congress would not have intended the balance to be struck again each time an agency action came under review.

This Court's subsequent decisions have warned against judicial imposition of additional procedural restraints on agency action. See, *e.g.*, *Federal Power Commission* v. *Transcontinental Gas Pipe Line Corp.*, 423 U.S. 326, 333, and *Federal Communications Commission* v. *Schreiber*, 381 U.S. 279, which recognized (*id.* at 290; citation and footnote omitted):

> the established principle that administrative agencies "should be free to fashion their own rules of procedure and to pursue methods of inquiry capable of permitting them to discharge their multitudinous duties." * * * This principle, which has been upheld in a variety of applications, is an outgrowth of the congressional determination that administrative agencies and administrators will be familiar with the industries which they regulate and will be in a better position than federal courts or Congress itself to design procedural rules adapted to the peculiarities of the industry and the tasks of the agency involved.

See, also, *United States* v. *Allegheny-Ludlum Steel Corp.*, 406 U.S. 742, 758.

Even if the statutory language, legislative history and judicial interpretation of Section 553 were less conclusive, there would be persuasive policy reasons for the exercise of judicial restraint in imposing additional procedural requirements on agency rulemaking. See Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review*, 59 Cornell L. Rev. 375, 387-388 (1974):

> If reviewing courts ignored the guidance of section 553 and instead operated under a vague injunction to find those procedures "best" suited to *each* agency action presented, judicial review of rulemaking would become totally unpredictable.
>
> The administrative response would, however, be completely predictable. Fearing reversal of his substantive initiatives, each administrator would clothe his agency's actions in the full wardrobe of adjudicatory procedure. By demanding procedural refinements on an ad hoc basis, reviewing courts would inadvertently induce agencies to adopt maximum procedures in all

cases. Seeking administrative variety, we would obtain administrative paralysis. The inherent virtues of rulemaking—expedition, flexibility to experiment, a sensible balance between expertise and broad public participation—would be forfeited. Like adjudicatory regulation today, rulemaking would become a lawyer's game.

B. The Court Of Appeals Improperly Imposed Procedural Requirements In Addition To Those Specified By Congress.

As we have shown, Section 553 leaves to agency discretion the determination whether additional procedures, not required by statute, will be utilized in informal rulemaking. A line of cases in the District of Columbia Circuit has, however, required the use of "hybrid rulemaking procedures"—*i.e.*, procedures in excess of those required by Section 553—in certain circumstances.[42] The court of appeals has explained these requirements as "a necessary adjunct to meaningful judicial review of highly technical issues." *Pickus* v. *United States Bd. of Parole*, 543 F. 2d 240, 246 (C.A. D.C.); accord, *Home Box Office, Inc.*

[42] See, *e.g.*, *American Airlines, Inc.* v. *Civil Aeronautics Board*, 359 F. 2d 624, 632 (C.A. D.C.), imposing "procedural requirements deemed inherent in the very concept of fair hearing for certain classes of cases, even though no such requirements had been specified by Congress"; *International Harvester Co.* v. *Ruckelshaus*, 478 F. 2d 615, 631 (C.A. D.C.), identifying "particular cases of need [for additional procedures], on critical points where the general procedure proved inadequate to probe "soft" and sensitive subjects and witnesses"; and *O'Donnell* v. *Shaffer*, 491 F. 2d 59, 62 (C.A. D.C.), requiring a "framework [for principled decision making] that is appropriate for the issue at hand."

v. *Federal Communications Commission*, *supra*, slip op. 51, and cases there cited. Congress, however, has not empowered the courts to alter the balance it struck in the APA on the basis of vague formulas intended to serve judicial convenience; there is no source of law in a non-Constitutional case such as this one that authorizes the courts to overlay the congressional scheme with more elaborate procedural requirements.

Even if it is assumed *arguendo* that the courts may, in extraordinary circumstances, require the use of additional procedures,[43] no such circumstances existed here. Extraordinary circumstances might encompass those no doubt rare instances where the Constitution commands more procedural rights than 5 U.S.C. 553 offers (cf. *Wong Yang Sung* v. *McGrath*, *supra*, 339 U.S. at 49-51), as well as unjustified departures from settled agency practice, such as an agency's refusal to employ for a particular rulemaking more extensive procedures ~~than~~ the agency has routinely afforded. Here, the Commission's quantification, by rule, of environmental impacts raises no colorable due process claim,[44] and its manner of proceeding was consistent with its previous practice.

[43] Davis, *Administrative Law of the Seventies*, Supplementing *Administrative Law Treatise*, Sec. 6.04-1 (1976); cf. Clagett, *Informal Action—Adjudication—Rulemaking: Some Recent Developments in Federal Administrative Law*, 1971 Duke L.J. 51, 78. But see Wright, *supra*, 59 Cornell L. Rev. at 385.

[44] See note 38, *supra*.

The court of appeals in *Vermont Yankee* recognized that "[a]bsent extraordinary circumstances, it is not proper for a reviewing court to prescribe the procedural format which an agency must use to explore a given set of issues" (App. 45). The court, nonetheless, set aside the agency rule because it found the procedural format adopted insufficient, without specifying why the circumstances of this rulemaking are extraordinary, or giving any guidance that would assist agencies contemplating rulemaking in identifying similar extraordinary circumstances.

The adverse effects on agency rulemaking of this lack of guidance are exacerbated by the fact that the court of appeals assessed the agency's selection of procedures from the hindsight vantage point of the completed record, rather than from the agency's perspective when it chose the rulemaking procedures. This Court observed in *Camp* v. *Pitts*, 411 U.S. 138, 142, that in review for abuse of discretion "the focal point for judicial review should be the administrative record already in existence, not some new record made initially in the reviewing court." As applied to review of agency discretion in choice of rulemaking procedures, the relevant "record in existence" is the information before the agency at the time it makes its choice, including its past experience with similar proceedings. Unless the reviewing court finds that the agency had no reasonable basis for believing the procedures selected could develop an adequate record, the

selection of those procedures cannot be said to have constituted an abuse of agency discretion.[45]

The court of appeals in effect recognized that the Commission did not abuse its discretion in selecting its fuel cycle rulemaking procedures by remarking that "the procedures the agency adopted in this case, if administered in a more sensitive, deliberate manner, might suffice." App. 67. But the court also applied a retrospective test, one where "[o]f necessity, assessing agency procedures requires that the reviewing court immerse itself in the record." App. 47. "What a reviewing court can do," the court's opinion states, "is scrutinize the record as a whole to insure that genuine opportunities to participate in a meaningful way were provided * * *." App. 46. The court of

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[45] Especially where, as in this case, the rulemaking hearing is conducted by a hearing board to which the Commission has delegated the function of developing the oral part of the record, rather than by the Commission itself, the rationality of the Commission's choice of procedures, if it is open to review at all, must be tested in terms of what was in prospect, rather than what later turned out. The realities of the agency rulemaking process are such that a denial of additional procedures cannot be fairly reviewed by the same approach a court would take, for example, in reviewing a lower court's on-the-spot decision not to allow cross-examination on a particular point. "[T]o assimilate the relation of * * * administrative bodies and the courts to the relationship between lower and upper courts is to disregard the origin and purposes of the movement for administrative regulation and at the same time to disregard the traditional scope * * * of the judicial process." *Federal Communications Commission* v. *Pottsville Broadcasting Co.*, 309 U.S. 134, 144.

appeals thus undertook to evaluate the Commission's choice of procedures on the basis of the record they in fact produced, rather than from the standpoint of the Commission's rationality in adopting them *ab initio*. The reasonableness of the Commission's choice of procedures was thus determined by the court from a perspective not available to the Commission when its choice was made.[46] If that method of judicial review were to prevail, the only way to protect the agencies from the serious interference with their effective functioning that would result from invalidation of their adopted rules would be to require that all rulemaking proceedings be conducted with full adjudicatory procedures, whatever the cost in efficiency and effectiveness in the carrying out of agency programs in furtherance of the public interest.

In short, the *ad hoc* judicial imposition of additional procedural requirements, based neither on the Constitution, on any statute, nor even on any clearly articulated standards of administrative law, would threaten to obstruct the functioning of the rulemaking process and to nullify much of its advantage over

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[46] The additional procedures required by the court were not even suggested to the Commission until five days before the hearing was to commence (note 10, *supra*). Even after the hearings, when the intervenors asserted specific flaws in the record to the Commission before its decision, none of the examples cited as demonstrating the need for cross examination related to waste management (note 12, *supra*). The court has thus set aside an agency rule for failure of the agency to conform to procedures neither required by Congress nor sought with reasonable and timely particularity by the parties challenging the proposed rule. See *American Airlines, Inc.* v. *Civil Aeronautics Board*, 359 F. 2d 624, 632-633 (C.A. D.C.).

case-by-case adjudication as the instrument for efficient development of agency policy. The flexibility which Congress intended agencies to have in the conduct of informal rulemaking would be severely constricted, as the agency would be left to guess which choice of procedures will satisfy a reviewing court years hence, under the risk that a mistaken guess will result in the eventual setting aside of rules that may be central to its regulatory program.

II. THE ENVIRONMENTAL IMPACT STATEMENT FOR CONSUMER'S MIDLAND REACTORS WAS ADEQUATE.

The Commission completed the preparation of its environmental impact statement for Consumers' Midland facility in 1972. The procedures by which it was prepared and considered included submission of the draft for public comment and the conduct of a full adjudicatory hearing in addition to the required written comment process. The statement itself, which treated major issues in substantial depth, fully complied with existing federal guidelines concerning issues to be treated (*infra*, pp. 58-59), and attached the 119 comments respondent Saginaw had submitted (R. 17631-17704). The hearing board, after reviewing these contentions and stating its understanding of them, conducted 14 days of hearings on the statement, in which respondent Saginaw failed to participate. When called on to suggest findings of fact at the conclusion of the hearings, Saginaw had "no conventional findings of fact to set forth" (App. 256),

making it, as the Licensing Board noted, "virtually impossible in some instances to know whether particular issues are in fact contested" (App. 190 n. 10). As the Appeal Board and the Commission observed, "[p]articipation in this manner * * * subverts the entire adjudicatory process" (App. 257, 342).

Wholly apart from the question whether energy conservation should have been one of the many subjects considered in the environmental analysis is the more fundamental issue whether this single alleged lapse occurring in a long and complex process with extraordinary scope for public participation and comment warrants reversal, as the court here found. Nothing in NEPA requires so active a judicial role in this context.

While NEPA does establish important substantive policies for the federal government and the nation in Section 101 (42 U.S.C. 4331), its mandate to federal agencies in Section 102 (42 U.S.C. 4332) is essentially procedural.[47] The basic purpose of Section 102 is to reform agency decision making *processes* so that environmental values are properly considered along with other important factors as an integral part of the decision making process. Section 102(2) has been characterized as an "action forcing" provision, de-

[47] *Aberdeen & Rockfish R. Co.* v. *Students Challenging Regulatory Agency Procedures (SCRAP II)*, 422 U.S. 289, 319; *Lathan* v. *Brinegar*, 506 F.2d 677, 689 (C.A. 9); *National Helium Corp.* v. *Morton*, 486 F.2d 995, 1001 (C.A. 10); *Environmental Defense Fund, Inc.* v. *Tennessee Valley Authority*, 468 F.2d 1164, 1176 (C.A. 6); *Calvert Cliffs' Coordinating Committee, Inc.* v. *Atomic Energy Commission*, 449 F.2d 1109, 1112 (C.A. D.C.).

signed to assure that this purpose is in fact achieved. 115 Cong. Rec. 40416 (1969); S. Rep. No. 91-296, 91st Cong., 1st Sess. 9 (1969); *Kleppe* v. *Sierra Club*, 427 U.S. 390, 409 n. 18. Thus, Section 102(2)(A) and (B) (42 U.S.C. 4332(2)(A) and (B)) require agencies to "utilize a systematic * * * approach which will insure the integrated use of * * * [environmental knowledge] in planning and in decisionmaking" and "identify and develop methods and procedures * * * which will insure that * * * [environmental values] may be given appropriate consideration in decisionmaking along with economic and technical considerations". The intent was to mesh environmental concerns with more traditional regulatory patterns. *Aberdeen and Rockfish R. Co.* v. *Students Challenging Regulatory Agency Procedures (SCRAP I)*, 409 U.S. 1207, 1218 (Burger, C.J., denying application for a stay).

The impact statement requirement of Section 102(2)(C) (42 U.S.C. 4332(2)(C)) is a further action forcing provision. It is a "discrete procedural obligation on Government agencies to give written consideration of environmental issues," *Aberdeen & Rockfish R. Co.* v. *Students Challenging Regulatory Agency Procedures (SCRAP II)*, 422 U.S. 289, 319, in order to provide evidence that the required consideration has in fact been made. *Calvert Cliffs' Coordinating Committee, Inc.* v. *Atomic Energy Commission*, 449 F.2d 1109, 1114 (C.A. D.C.).

Once the impact statement required by Section 102(2)(C) has been prepared, the role of a court re-

viewing the sufficiency of an agency's consideration of environmental factors is limited.

> Neither the statute nor its legislative history contemplates that a court should substitute its judgment for that of the agency as to the environmental consequences of its actions. * * * The only role for a court is to insure that the agency has taken a "hard look" at environmental consequences; it cannot "interject itself within the area of discretion of the executive as to the choice of the action to be taken."

Kleppe v. *Sierra Club*, *supra*, 427 U.S. at 410 n. 21, quoting with approval *Natural Resources Defense Council, Inc.* v. *Morton*, 458 F. 2d 827, 838 (C.A. D.C.).

Moreover, (*Natural Resources Defense Council, Inc.* v. *Morton*, *supra*, 458 F. 2d at 838 (footnote omitted)),

> [s]o long as * * * agencies have taken the "hard look" at environmental consequences mandated by Congress, the court does not seek to impose unreasonable extremes * * *.

See, also, *New York* v. *Kleppe*, 429 U.S. 1307, 1311 (Marshall, J., denying application to vacate stay).

Accordingly, the public nature of the environmental review process and the many opportunities which exist for correcting substantive oversight before the agency tend to assure achievement of the Act's purposes. Obviously, failure to produce a required statement may require judicial intervention,[48] as indeed

may an improperly unresponsive public process or a significantly deficient analysis. But the single alleged shortcoming on a peripheral issue, urged on the court here by a party that refused to cooperate with the agency's efforts, is an inappropriate basis for reversal. See *Ogunquit Village Corp.* v. *Davis*, C.A. 1, No. 76-1425, decided April 20, 1977; *Sierra Club* v. *Morton*, 510 F.2d 813, 826 (C.A. 5); *Environmental Defense Fund, Inc.* v. *Corps of Engineers*, 492 F.2d 1123, 1135-1136 (C.A. 5); *Natural Resources Defense Council, Inc.* v. *Tennessee Valley Authority*, 367 F. Supp. 128, 131 (E.D. Tenn.). Even in a criminal case, the defendant is entitled only to a fair trial, not a perfect one. *Lutwak* v. *United States*, 344 U.S. 604, 619; *Bruton* v. *United States*, 391 U.S. 123, 135; *Schneble* v. *Florida*, 405 U.S. 427, 432.

A. The Commission Had No Independent Obligation In 1972 To Consider Whether Energy Conservation Might Affect The Need For The Proposed Plant.

Under the Atomic Energy Act of 1954, questions of the need for power to be supplied by a proposed facility are reserved to state public utility com-

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[48] See, *e.g.*, *Hart* v. *Denver Urban Renewal Authority*, 551 F.2d 1178 (C.A. 10); *Swain* v. *Brinegar*, 542 F.2d 364 (C.A. 7); *Cady* v. *Morton*, 527 F.2d 786 (C.A. 9); *Jones* v. *Lynn*, 477 F.2d 885 (C.A. 1); *Environmental Defense Fund, Inc.* v. *Froehlke*, 473 F.2d 346 (C.A. 8); *Wyoming Outdoor Coordinating Council* v. *Butz*, 484 F.2d 1244 (C.A. 10); *Ely* v. *Velde*, 451 F.2d 1130 (C.A. 4).

missions and like bodies (42 U.S.C. 2021(k)). Prior to the passage of NEPA, the Commission did not consider this issue; it has done so in conjunction with its NEPA analyses since the court of appeals' decision in *Calvert Cliffs'*, *supra*, but whether it could lawfully decline to issue a license on the ground that the power from the plant was not needed, despite a state public utility commission conclusion to the contrary, has never been judicially determined. Cf. *Public Service Co. of New Hampshire*, 5 N.R.C. 503, March 31, 1977 (Seabrook Station, Units 1 and 2). The environmental impact statement for the Midland facility considered the need for the power to be produced, but that issue was—and remains—outside the Commission's central responsibility for public health and safety.

One possible sub-issue, or alternative, to be considered in connection with the need for power is whether conservation measures could obviate the need for the power to be generated by the proposed facility. The Commission has no authority to impose or enforce such conservation measures, but it might be argued that if it refused to license a facility because it would be unnecessary if energy were effectively conserved, that would lead local authorities to require conservation. The Commission did not specifically consider the possibility of conservation as an alternative to the production of more power, and it was this failure which the court of appeals found "capricious and arbitrary," requiring new hearings on

the construction permit that had been issued (App. 104).[49]

As with the choice-of-procedures question discussed above, pp. 38-51, *supra*, this issue is one which ought to have been decided, not on the basis of judicial hindsight, but from the perspective of the first half of 1972, when the statement under challenge was being prepared and reviewed. The Commission recognized in its January 1974 opinion (App. 324, 344) that "[a]s we gain experience on a case-by-case basis and hopefully, feasible energy conservation techniques emerge, the applicant, staff, and licensing boards will have obligations to develop an adequate record on these issues in appropriate cases, whether or not they are raised by intervenors." In fact, current Commission practice is to require consideration of such issues in each case (10 C.F.R. 51.23(d)), but that does not mean it was required to do so in 1972.

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[49] In contrast, the D.C. Circuit had recognized in *Natural Resources Defense Council, Inc.* v. *Morton*, *supra*, 485 F.2d at 837-838:

> There is reason for concluding that NEPA was not meant to require detailed discussion of the environmental effects of "alternatives" put forward in comments when these effects cannot be readily ascertained and the alternatives are deemed only remote and speculative possibilities, in view of basic changes required in statutes and policies of other agencies—making them available, if at all, only after protracted debate and litigation not meaningfully compatible with the time-frame of the needs to which the underlying proposal is addressed.

Indeed, the opinion below makes plain the court of appeals' use of later perspectives, particularly in its extensive reliance on an April 1976 report.[50] It would be hard to conclude that in 1972 there appeared to be a reasonable likelihood that the demand for the energy to be produced by the plant could be met by the use of effective techniques for conserving energy. This was before the Arab oil embargo, fuel shortages, rising energy prices, and the concomitant sense of national crisis had focused substantial research efforts and public attention on the need and particular methods for conserving energy.[51] Particularly significant in assessing the reasonableness of the Commission's action in 1972 is the absence from the 1971 federal guidelines for the preparation of environmental impact statements of any suggestion that energy conservation should be considered as an alternative (36 Fed. Reg. 7725). Not until the Council on En-

[50] App. 102 and n. 15.

[51] The Arab oil embargo of October 1973 brought a dramatic increase in the price of oil. While the price of world oil had risen only 11 cents per barrel in 1972 and had been stable for decades (between 1947 and 1970 the price of oil decreased in terms of constant dollars), from October 1, 1973 to January 1974 prices rose from $3.01 a barrel to $11.65 a barrel. Congressional Quarterly, *Continuing Energy Crisis in America* 14 (1975). See also Foster Associates, Inc., *Energy Prices 1960-1973—A Report to the Energy Policy Project of the Ford Foundation* 37-39 (1974). The embargo acted as a spur toward study of energy conservation as an important constituent of the nation's energy policy. See, generally, Ford Foundation, *A Time to Choose: America's Energy Future* (1974); Federal Energy Administration, *Project Independence* (1974).

vironmental Quality (CEQ) amended the guidelines on August 1, 1973, more than a year after the close of the record in the Midland case, did the federal guidelines even arguably call for consideration of energy conservation in an environmental impact statement.[52] That amendment, by its terms, was to become effective January 28, 1974, more than one and one-half years after the Midland record closed (38 Fed. Reg. 20550, 21265).[53]

The court of appeals' use of judicial hindsight in this case threatens to make finality in the lengthy and complex agency proceedings in this field almost impossible to achieve, particularly in view of rapidly developing energy technologies and perspectives. As this Court has repeatedly emphasized (*Interstate Commerce Commission* v. *Jersey City*, 322 U.S. 503,

[52] See 40 C.F.R. 1500.8(a)(4); CEQ Memorandum for Heads of Agencies (August 2, 1973) and attachment. Even then the agency was simply to consider "alternatives related to different designs or details of the proposed action which would present different environmental impacts (*e.g.*, cooling ponds vs. cooling towers for a power plant or alternatives that will significantly conserve energy)." 40 C.F.R. 1500.8(a)(4). In context, what is called for is that the agency consider whether more energy-efficient facilities could be constructed (CEQ Memorandum, *supra*, Att. A at 2, para. 6), not whether, as Saginaw contends, the public consumption of energy could be reduced so that the power to be produced by the plant would not be needed.

[53] The Commission's recognition, in its *Niagara* decision, of the desirability of treating energy conservation issues for the future was contemporaneous with the CEQ guideline and the FPC procedures relied on by the court (App. 102).

514; *United States* v. *Interstate Commerce Commission*, 396 U.S. 491, 521):

> Administrative consideration of evidence * * * always creates a gap between the time the record is closed and the time the administrative decision is promulgated. This is especially true if the issues are difficult, the evidence intricate, and the consideration of the case deliberate and careful. If upon the coming down of the order litigants might demand rehearings as a matter of law because some new circumstance has arisen, some new trend has been observed, or some new fact discovered, there would be little hope that the administrative process could ever be consummated in an order that would not be subject to reopening.

This case presents a nearly classic example of that problem. Commission proceedings for the issuance of a construction permit for a nuclear plant take years —the instant one took nearly four [54]—and involve highly complex, technical reviews that are strongly dependent on the state of the technological art. Appeal Board, Commission, and judicial review of Licensing Board decisions may consume additional years—nearly another four in this case.[55]

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[54] Consumers' application for a construction permit was filed in January 1969. App. 185. The Licensing Board's initial decision and order directing the issuance of a construction permit was dated in December 1972. App. 222.

[55] The court below issued its decision in July 1976, more than three and one half years after the construction permit issued.

As with the procedural question discussed in point I, *supra*, the court of appeals' approach here would tend to disrupt, rather than enhance, achievement of the statutory objectives. There, it would force agencies to use excessive and possibly stultifying procedures in conducting rule-making proceedings. Here, it would create similar problems for agencies in preparing environmental impact statements. If the courts of appeals stand ready to reverse an extensively considered agency action because of a single alleged shortcoming on a peripheral issue in a complex environmental analysis, the level of attention to detail must increase, not diminish.[56]

B. Intervenors Did Not Adequately Present Energy Conservation Issues.

The court of appeals concluded that (App. 100-101; footnote omitted):

> an intervenor's comments on a draft EIS raising a colorable alternative not presently considered therein must only bring "sufficient attention to the issue to stimulate the Commission's consideration of it." Thereafter, it is incumbent on the Commission to undertake its own preliminary investigation of the proffered alternative suffi-

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[56] Cf. Executive Order 11991, 42 Fed. Reg. 26967, which directs the CEQ to "[i]ssue regulations to Federal agencies * * * to reduce paperwork and the accumulation of extraneous background data [in the preparation of environmental impact statements], in order to emphasize the need to focus on real environmental issues and alternatives * * * [and to] require impact statements to be concise, clear, and to the point, and supported by evidence that agencies have made the necessary environmental analyses."

cient to reach a rational judgment whether it is worthy of detailed consideration in the EIS.

The Commission, on the other hand, phrased the intervenor's responsibility as follows (App. 344 and n. 27):

> [A]t this emergent stage of energy conservation principles, intervenors * * * must state clear and reasonably specific energy conservation contentions in a timely fashion. Beyond that, they have a burden of coming forward with some affirmative showing if they wish to have these novel contentions explored further.[27]

[27] We do not equate this burden with the civil litigation concept of a *prima facie* case, an unduly heavy burden in this setting. But the showing should be sufficient to require reasonable minds to inquire further. * * *

In practical effect, this difference in approach led the court to conclude that Saginaw had sufficiently raised energy conservation issues to require further examination by the Commission. The court pointed to four examples in Saginaw's 119 contentions as showing how Saginaw had "forcefully pointed out" the need for energy conservation (App. 93-94 and n. 6).[57] The contention the court identified as raising

[57] As the Commission noted (App. 333-334), although Saginaw ultimately identified 17 of its 119 contentions as bearing on energy conservation, "its original submission to the Board did not point up any such common theme." For example, although the court below faulted the Commission for "conflating" intervenors' arguments relating to energy conservation

the question whether modifications in the rate structure would encourage the conservation of energy states (App. 1367-1368):[58]

> Applicant and the Michigan Public Service Commission have illegally created an incentive for continual construction of generating facilities when they are unnecessary. The rate structure imposed upon Applicant by the Michigan Public Service Commission encourages Applicant to create unwarranted costs upon the environment. Because Applicant's ability to receive a fair return on its invested capital is directly related to outstanding amounts of unamortized construction and other capital costs, Applicant has an incentive to continue to construct power facilities, whether necessary or not, in order to maintain an artifically high rate structure. Specifically, Intervenors contend that Applicant is failing to use existing generating facilities to the extent of their useful lives and it is taking such facilities out of base load or peaking service after such facilities have been amortized and removed from consideration of Applicant's rate structure. Thus, the proposed plant represents an attempt to construct a facility in order to maintain an artifi-

and those challenging the social utility of the ways in which Consumers' customers planned to use the electricity (App. 95-96 n. 8), any apparent confusion is due to the fact that the Commission was responding to Saginaw's arguments as they were presented.

[58] The court below incorrectly identifies this as paragraph 48; it is in fact paragraph 49.

cally high rate structure and, as such, it represents an unwarranted cost to the environment."[59]

The Commission, while noting that the thrust of Saginaw's rate structure argument is that current rates tend to encourage construction of unneeded plants rather than that they encourage high-volume use of electricity, emphasized that the Board had recognized the relevance of such arguments in the licensing proceeding (App. 336-337, 341). But, it concluded, Saginaw had failed to support these claims with any elaboration requiring further exploration by the Board (App. 344). In sum, the Board was entitled to rely on the substantial evidence of record in finding as a fact that the postulated demand was reasonable and reflected normal industrial and residential uses (App. 334-335).[60]

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[59] In addition, in paragraph 88 (App. 1384), after challenging the projections of energy use by major industrial consumers of power, Saginaw states:

> Concomitantly, Applicant has failed to factor into its projection the possibility that rate structures will be revised so as to make large use of electricity on a per unit basis more expensive thereby discouraging the increased use of electricity.

[60] The treatment of the other 16 contentions ultimately identified by Saginaw as relating to energy conservation was similar. The court of appeals identified (App. 93-94 and n. 6) three other paragraphs as "forcefully" raising energy conservation issues: Paragraph 47, relating to promotional advertising (App. 1366-1367), paragraph 87 relating to air conditioner usage (App. 1383-1384), and paragraph 85, relating to a generalized need for "conservation of energy resources" (App. 1383). The Licensing Board invited intervenors to present some evidence in support of each of these contentions, but in the absence of any specific suggestions of ways in which projected demand might be effectively reduced, the Commission relied on the record evidence indicating that the applicant's demand projections were reasonable (App. 334-339).

The Commission's approach was entirely reasonable. It simply required intervenors to formulate their objections with at least minimal specificity, and to indicate more precisely the ways in which their suggestions might lead to a reduced need for power. For example, as the Commission noted, the intervenors in *Niagara* had been sufficiently specific to require the Board in that case to consider the applicant's rate structure by suggesting "[c]hanges in the rate structure for electricity designed to decrease demand—such as modification of volume discounts, or raising prices during peak demand periods" (App. 329).

The court of appeals incorrectly concluded (App. 100) that the Commission had placed on the intervenors the entire burden of compiling information bearing on whether the proposed alternative is promising enough to merit detailed consideration in the impact statement, and had required intervenors to prove that the proposed alternative satisfied the rule of reason before the Commission would investigate it. Instead, the Commission has required only that an intervenor indicate with some specificity that his suggested alternative would affect the cost-benefit analysis—and thus alert the Commission that further

inquiry is reasonable. The test is, in fact, very similar to the one approved by the D.C. Circuit in considering an agency's responsibility to investigate comments on proposed rule making:

> [C]omments must be significant enough to step over a threshold requirement of materiality before any lack of agency response or consideration becomes of concern. The comment cannot merely state that a particular mistake was made [in the agency's reasoning]; it must show why the mistake was of possible significance in the results * * *.

Portland Cement Association v. *Ruckelshaus*, 486 F. 2d 375, 394 (C.A. D.C.), certiorari denied *sub nom. Portland Cement Corp.* v. *Administrator, Environmental Protection Agency*, 417 U.S. 921.

Accordingly, it was error for the court of appeals to reverse the Commission on this record, even if the Commission should have considered energy conservation issues more extensively had they been brought properly to its attention.

III. THE ACRS REPORT SHOULD NOT HAVE BEEN RETURNED TO THE ACRS FOR SUPPLEMENTATION.

The court of appeals also erred in remanding the Advisory Committee on Reactor Safeguards report to the Committee for clarification of the reference to "other problems related to large water reactors * * * identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports" (App. 105, 108).

In so doing, it created a remedy no party had sought before the Commission or the court, one which was not available under Commission practice and which is inconsistent with the statute and with existing demands on the Advisory Committee's limited resources.

Ensuring that nuclear reactors are safe enough to permit their operation without endangering the health and safety of the public is a major function of the Commission. See, *e.g.*, 42 U.S.C. (Supp. V) 5841 (f), 5843(b). That this is a highly technical job needs no elaboration.

The Commission has long recognized the need for independent expert technical advice to supplement its own understanding and the work of its staff. Thus, it established an independent Reactor Safeguards Committee in 1947, through exercise of its administrative authority. The Committee, then as now, consisted of 15 outstanding experts from a variety of disciplines, who are primarily employed by other institutions and spend only about one-third of their professional time with the Committee. They bring to the Committee, and thus to the Commission, an independent perspective on nuclear problems and an unusually high level of professional achievement. Their reports were originally provided in confidence in the belief that this would promote objectivity, but the Committee nonetheless came to enjoy great prestige.

In 1957 Congress made the Committee a statutory body, 71 Stat. 576, and in the course of doing so required that a Committee report be received prior to the licensing, *inter alia*, of any nuclear power facility for construction and that this report be made public. 42 U.S.C. 2232(b). The character of the Committee, however, remained unchanged. Nothing in either the statute or its legislative history indicates that, by making the Committee's reports public, Congress intended to make significant changes in the demands on the Committee's time. The legislative history indicates that Congress recognized the great prestige that the Committee already enjoyed, and simply wished to make the results of its deliberations, as they stood, known to the public.[61]

The primary function of the ACRS reports on individual nuclear reactors proposed for licensing is to

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[61] See S. Rep. No. 296, 85th Cong., 1st Sess. 24 (1957):

> One of the main reasons for the sources [sic] of the Commission's reactor safety activities in the past has been the close scrutiny of the AEC-built reactors and great prestige of its present Reactor Safeguards Committee. The Joint Committee [on Atomic Energy] desired this same type of scrutiny and prestige to be maintained with respect to privately built power and testing reactors.

Accord, A Study of AEC Procedures and Organization in the Licensing of Reactor Facilities, Joint Committee Print, 85th Cong., 1st Sess. 32-34 (1957) (hereafter "A Study of AEC Procedures").

communicate the Committee's views on highly technical matters to the Commission's technical staff.[62] Since the Committee works at the direction of the Commission, the Commission has adequate power to return an ACRS report to the Committee for elaboration if the Commission's staff finds it unclear. It has done so in the past from time to time,[63] and will continue to do so whenever the need arises. But since the Committee is designed to serve solely as an advisory committee to the Commission, the only function of judicial review is to assure that the ACRS has reviewed the application in question and that its report has been made public and entered into the record for the facility as the statute requires (42 U.S.C. 2232(b)).

The court below discerned a separate, judicially enforcible duty of the ACRS to state its views to the public. It relied on language in the legislative history indicating that the ACRS report "is to be made public so that all concerned may be apprised of the safety

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[62] The Section of the Atomic Energy Act establishing the ACRS states that (42 U.S.C. 2039):

> The Committee shall review safety studies and facility license applications referred to it and shall make reports thereon, shall advise the Commission with regard to the hazards of proposed or existing facilities and the adequacy of proposed reactor safety standards, and shall perform such other duties as the Commission may request. * * *

See S. Rep. No. 296, 85th Cong., 1st Sess. 24 (1957); A Study of AEC Procedures, *supra* note 60, at 32-33 (1957).

[63] See, *e.g.*, letter of February 12, 1975, from NRC Chairman Anders to William Kerr, Chairman, ACRS.

or possible hazards of the facility," and on the Joint Committee's view that "when the public is adequately and accurately informed * * * it will be in a better position to accept the construction" of nuclear reactors (S. Rep. No. 296, 85th Cong., 1st Sess. 24 (1957); App. 107-109).

The court admitted that "the reference [in the ACRS report here] to 'other problems' identified in previous ACRS reports may have been adequate to give the Commission the benefit of the ACRS members' technical expertise" (App. 107-108). Nevertheless, it held (App. 108) that the Licensing Board should *sua sponte* have returned the report to the ACRS for

> a short explanation, understandable to the layman, of the additional matters of concern to the committee, and a cross-reference to the previous reports in which those problems, and the measures proposed to solve them, were developed in more detail.

The imposition of such a requirement on an advisory body of limited resources, enforced years after the fact by judicial oversight, is most extraordinary. It should not be undertaken in the absence of a clear indication that Congress intended such a result. It is particularly inappropriate here, where a likely alternative explanation for the "public report" provision is manifest. As the court of appeals itself recognizes (App. 107), the "public report" requirement was designed to avoid the possibility that the Commission might license a facility despite an adverse ACRS report that was concealed from the public.

See *Union of Concerned Scientists* v. *Atomic Energy Commission*, 499 F. 2d 1069, 1073 n. 5, 1075 n. 15 (C.A. D.C.). The purpose of requiring publication of the report was thus to make the position of the ACRS a matter of public record, rather than to permit public evaluation of the basis for the ACRS position.[64] The publication of the ACRS report on the Midland reactors satisfied that purpose, and thus it complied with the statute.

In any event, there was no need to supplement the report here. The report explained that the "other problems related to large water reactors" of concern to the ACRS were those "cited in previous ACRS reports" (App. 105).[65] These problems were further identified by the ACRS in a list prepared shortly after the Licensing Board's initial decision, which identified the Committee's generic safety concerns. The Committee explained that this list identified the "other problems" mentioned in the Midland report and in ACRS reports on other individual facilities. (R. 24389-24395). The list noted those problems the ACRS considered resolved on a generic basis and described the solution or listed the titles of documents setting forth the solution. The list also identified those problems which would require case-by-case consideration until a generic resolution was achieved.

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[64] Information bearing on that evaluation is available to the public in ample detail in the staff safety evaluation report (see *supra*, pp. 6-8).

[65] All ACRS reports are available to the public in the Commission's Public Document Room.

Respondents introduced the list into the record of this proceeding (R. 24385-24388).[66] Thus, any lack of specificity in the reference in the Midland report to "other problems" was cured by the latter report.

Even if it is assumed, *arguendo* that the ACRS report was not sufficiently detailed, directing that the report be returned to the ACRS was an inappropriate remedy. The Committee is limited by statute to fifteen members, who because of their exceptional training and abilities are particularly capable of providing vital advice to the Commission. Since they are employed by other institutions, the time they can devote to Committee business is strictly limited. In these circumstances, the courts should be reluctant to divert the Committee from its primary function by imposing additional duties on it.

But the court below concluded, without discussion, that the Licensing Board should have returned the report "*sua sponte* to ACRS for further elaboration" (App. 108). It thus directed an intrusion on the Committee's time that was inappropriate, a remedy not provided for in the Commission procedures, not sought before the Commission, and not argued to the court. In this case, the Committee's subsequent generic letter also made it, as a matter of fact, unnecessary. Beyond this, the court's conclusion that the Licensing Board should have returned the report to the ACRS misconceives the function of the Committee, which is designed to provide the Commission with

[66] The list is also available in the Commission's Public Document Room.

technical advice on a variety of matters. 42 U.S.C. 2039. It is thus for the Commission, not an individual Licensing Board, to determine the matters that are important enough, in relation to the other work of the Committee, to warrant its attention.

The remedy created here, like the court's approach on the procedural and NEPA issues, would generate substantial pressure for over-elaborate systems or responses in order to avoid the possibility of future reversals. Many Committee reports contain similar references to other problems, making the potential precedential effect of the decision below serious. To date, the Committee has been free from the pressures of litigation—as in the balance of its opinion the court recognized was properly the case. The remedy ordered here, however, would have the ultimate effect of subjecting the Committee to just such pressures.[67]

[67] If the court had simply required the Committee to identify the other reports in which the problems were described, the pressure would have been less severe. But the court required in addition "a short explanation, understandable to a layman" of each problem so identified (Pet. No. 76-528, App. 20).

CONCLUSION

For the foregoing reasons, the judgment of the court of appeals in No. 76-419 should be reversed, and the judgment in No. 76-528 should be reversed insofar as it remands the orders granting construction permits for the Midland reactors to the Commission for further proceedings.

Respectfully submitted.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *ET AL.*,
Respondents

No. 76-528

CONSUMERS POWER COMPANY,
Petitioner

v.

NELSON AESCHLIMAN, *ET AL.*,
Respondents

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF FOR RESPONDENTS BALTIMORE GAS AND ELECTRIC COMPANY, *ET AL.* IN NO. 76-419

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BRIEF FOR RESPONDENTS BALTIMORE GAS AND ELECTRIC COMPANY, *ET AL.* IN NO. 76-419

OPINIONS BELOW

These consolidated cases involve review of two decisions of the United States Court of Appeals for the District of Columbia Circuit. In No. 76-419, the opinion below, *Natural Resources Defense Council, Inc.* v. *United States Nuclear*

Regulatory Commission, together with separate statements by Chief Judge Bazelon and Judge Tamm, was issued on July 21, 1976, *App.* 28-86, and corrected by an order of the court of appeals issued on October 8, 1976, *App.* 87-88. The opinion as corrected is reported at 547 F.2d 633. The uncorrected version of the opinion is unofficially reported at 9 ERC 1149.

In No. 76-528, the opinion below, *Aeschliman* v. *United States Nuclear Regulatory Commission,* was also issued on July 21, 1976. *App.* 89-111. It is officially reported at 547 F.2d 622 and unofficially reported at 9 ERC 1289.

JURISDICTION

The judgment of the court of appeals was entered on July 21, 1976. Vermont Yankee's petition for a writ of certiorari was filed on September 21, 1976. That petition was granted on February 22, 1976. This Court has jurisdiction under 28 U.S.C. §§ 1254(1) and 2350(a) (1970).

Respondents Baltimore Gas and Electric Company, *et al.,* intervenor respondents in *NRDC* v. *NRC, supra,* filed a petition for a writ of certiorari with this Court on October 19, 1976 (No. 76-548). That petition is presently pending. Baltimore Gas and Electric Company, *et al.* are nominal respondents in No. 76-419 by operation of Rule 21(4) of the Rules of this Court, and are filing this brief at this time in support of petitioner Vermont Yankee also pursuant to Rule 21(4).

QUESTIONS PRESENTED

This brief addresses only the following issues raised in the petition for a writ of certiorari filed by petitioner Vermont Yankee:

1. Did the court of appeals apply an erroneous standard of review in determining the adequacy of the uranium fuel cycle rulemaking record?
2. Did the court of appeals have authority to direct the use of special rulemaking procedures on remand of portions of the Uranium Fuel Cycle Rule?

STATUTES AND REGULATIONS INVOLVED

The following statutes and regulations are set forth in the Appendix to this brief:

1. Administrative Procedure Act §§ 4, 10(e), 5 U.S.C. §§ 553, 706 (1970) (A-1 through A-3)
2. Atomic Energy Act of 1954 § 189, 42 U.S.C. § 2239 (1970) (A-3 through A-4)
3. National Environmental Policy Act of 1969 § 102, 42 U.S.C. § 4332 (1970 & Supp. V 1975) (A-4 through A-7)
4. 10 C.F.R. § 51.20(e) (1977) (A-7 through A-9)

STATEMENT OF THE CASE

The uranium fuel for nuclear power plants in the United States is produced, used, and reclaimed in a multistep "fuel cycle" ending with the disposal or management of residual wastes.[1] In November 1972 the Atomic Energy Commis-

[1] The steps in the complete uranium fuel cycle include mining and milling of uranium ore, its chemical conversion to a usable form, its enrichment in fissionable isotopes of uranium, its fabrication into fuel, its fissioning in a reactor to produce power, reprocessing of spent fuel, disposal or management of radioactive waste, and associated transportation links. Of these steps only fissioning of fuel and temporary storage of spent fuel and waste take place at nuclear power plants. The other activities in the fuel cycle occur elsewhere and are subject to stringent licensing requirements distinct from those governing nuclear power plants. A policy statement by President Carter on April 7, 1977 proposes to defer the commercial reprocessing of spent reactor fuel. If effectuated, this policy would affect the "back end" of the fuel cycle, *i.e.*, the reprocessing and waste management/disposal steps.

sion[2] began a rulemaking to collect and summarize information on those environmental effects of each step in the uranium fuel cycle which might be attributable to the annual operation of a nuclear power plant. The rulemaking's conclusions, as crystallized in a so-called Table S-3, were ordered by the Commission to be included thereafter in the environmental impact statement prepared as part of the agency's review of every proposed nuclear power plant. The court of appeals in the decision below upheld most aspects of Table S-3, but set aside the parts of it relating to the reprocessing and waste management steps of the fuel cycle.

I.
Administrative Proceedings

The Commission commenced its rulemaking on the Environmental Effects of the Uranium Fuel Cycle with a *Federal Register* notice published on November 15, 1972. 37 Fed. Reg. 24191, *App.* 352. The notice proposed amendments to the agency's environmental review regulations and announced the availability of an Environmental Survey underlying the proposed rule.[3] The notice also set forth Table S-3,

[2] The Atomic Energy Commission (AEC) was abolished by the Energy Reorganization Act of 1974, 42 U.S.C. §§ 5801-5891 (Supp. V 1975), which also created the Nuclear Regulatory Commission (NRC) and transferred to it the AEC's licensing and regulatory functions, 42 U.S.C. §§ 5841(a), (f), 5871. Hereinafter, the term "Commission" applies to both the AEC and the NRC as appropriate.

[3] Compiled by the Commission's Regulatory Staff, the report bore as its full title "Environmental Survey of the Nuclear Fuel Cycle" (November 1972). The Environmental Survey was not intended to be a detailed environmental impact analysis of each discrete phase of the uranium fuel cycle. 39 Fed. Reg. 14188 (April 22, 1974), *App.* 385. Rather, it described on an annualized basis the environmental effects of the uranium fuel cycle attributable to a typical nuclear power plant and presented the methodology and assumptions used by the Regulatory Staff in arriving at its conclusions. Pertinent portions of the Environmental Survey and of its subsequent revision (WASH-1248, *infra* n.8) are set forth at *App.* 538-646, 1194-1339.

a tabular summation of the Environmental Survey's findings. The notice solicited public comment on the Environmental Survey and Table S-3, and stated that the Commission would subsequently hold a legislative-type hearing on the proposal to amend its regulations by adopting Table S-3 as a standard quantitative depiction, for reactor licensing purposes, of the annual environmental effects throughout the uranium fuel cycle attributable to reactor operation. 37 Fed. Reg. 24191, 24193, *App.* 352, 358-59. All interested persons were provided an opportunity to become participants in the rulemaking. 37 Fed. Reg. 24193, 38 Fed. Reg. 49, 50 (1973), *App.* 359, 361, 363. Respondents Baltimore Gas and Electric Company, *et al.*, participated jointly in the rulemaking hearing.

On January 3, 1973, the Commission by notice established a three-member Hearing Board and provided that participants could make oral statements as well as written submissions. 38 Fed. Reg. 49, *App.* 361.

Several weeks prior to the hearings, the Commission made available in its Public Document Room the background studies, internal Regulatory Staff calculations and other supporting materials used in preparing the Environmental Survey, as well as prior drafts of the Survey as edited by the Regulatory Staff. 39 Fed. Reg. 14188, 14190-91 (1974), *App.* 385, 397.

Only one rulemaking participant, respondent Consolidated National Intervenors (CNI), asked for additional documents and that request was promptly honored. 39 Fed. Reg. 14189 n. 2, *App.* 390 n. 2.

A "Procedure Planning Session" was held on January 17, 1973 to schedule the appearance of witnesses and to discuss and refine further the procedures previously set forth in the notice of rulemaking. The Hearing Board indicated that it would question the Regulatory Staff and other participants.

Transcript 4, 5 [hereinafter cited as "Tr."], *App.* 658, 659; *see* 38 Fed. Reg. 50 (1973), *App.* 362. The Hearing Board also asked that the participants be accompanied at the hearings by expert witnesses able to answer technical questions, so as to aid the Board's development of a complete, informative record for the Commission. Tr. 20, *App.* 670-71. All participants were allowed to submit pre- and post-hearing written material, including rebuttal to the written and oral statements made by the Regulatory Staff and other participants.

At the hearings, held February 1-2, 1973, respondent Natural Resources Defense Council (NRDC) was represented by respondent CNI. Testimony was presented by the Regulatory Staff, CNI and NRDC, and nine other participants including Baltimore Gas and Electric Company, *et al.* Written comments were received from 46 individuals and groups. No testimony was excluded or limited for irrelevancy, duplication, or any other reason. Throughout the proceeding, the Board voiced its desire for a complete record and encouraged the participants—particularly CNI—to submit their views fully.[4]

Respondent CNI, at the Procedure Planning Session, did not request that any procedures be employed at the rulemaking beyond those set forth in the notice of hearing. At the hearings themselves, however, CNI offered what amounted to a counterproposal to the scheduled rulemaking: namely, that the Commission conduct an ongoing "full generic hearing on the question of the nuclear fuel cycle, which is subject to full adjudicatory rights," including discovery and cross-examination on all issues. Tr. 217-18, *App.*

[4] *E.g.*, Tr. 20, 43, 338-41, 395, 452-53, 517-18; *App.* 671, 688, 936-38, 951-52, 1000-01. The transcript of these hearings is set forth almost in entirety at *App.* 655-1023.

844. CNI further argued that the proposed rule must "at some stage in the procedure be subjected to the full adjudicatory rights under the Administrative Procedure Act." Tr. 338, *App.* 936.

In response, Baltimore Gas and Electric Company, *et al.* and other participants contended that, in order to establish a right to such special procedures, CNI and NRDC first had a duty to specify questions of substantial importance that could not be resolved by existing procedures.[5] CNI and NRDC, while expressing general misgivings on various technical issues,[6] never attempted to make such a showing.[7]

Upon conclusion of the oral hearings, the record was left open by the Hearing Board for 30 days pursuant to the notice of hearing; numerous participants took advantage of this opportunity to file further comments. *App.* 367-68. CNI requested and was granted an additional period to file its post-hearing submissions, and the participants were then granted the opportunity to file comments on each others' post-hearing submissions. *App.* 368. Thereafter, the Hearing

[5] *E.g.*, Tr. 52, 436-38, 444, 468-71, 475-80, *App.* 694, 983-84, 994, 1013-16, 1019-22. Reply of 14-Member Utility Group to CNI-UCS "Statement with Respect to Legal Considerations" of March 2, 1973 at 8-13 (March 16, 1973).

[6] CNI and NRDC's technical presentations took two forms: oral testimony at the hearings by Drs. Edward P. Radford, Jr. and Henry W. Kendall, and the submission on March 9, 1973 of written supplementary comments. Dr. Radford made general comments and responded to questions from the Board on occupational radiological exposure in mines, at power plants and at reprocessing facilities. Tr. 219-63, *App.* 845-78. Dr. Kendall spoke generally to and was questioned on hypothetical accidents at power plants, the diversion of fissionable material for illegal purposes, and the management of radioactive wastes. Tr. 263-304, *App.* 879-910. The supplementary comments outlined certain high-level waste storage techniques and addressed the radiological effects of a fuel reprocessing plant in New York which ceased operation in 1971.

[7] See text 30-33 *infra* & accompanying notes.

Board, in accordance with the notice of hearing, issued its report to the Commission describing the proceedings before it and identifying issues raised therein, and certified the hearing record to the Commission for decision. *App.* 364-84.

After reviewing the fuel cycle rulemaking record and other related data available to it, the Commission revised the Environmental Survey,[8] including Table S-3, and issued its Uranium Fuel Cycle Rule, which required that the values set forth in revised Table S-3 be factored thereafter into the cost-benefit analyses for all proposed nuclear power plants. 39 Fed. Reg. 14188 (1974), *App.* 385.[9] Following issuance of the final rule, NRDC and CNI petitioned for its review in the U. S. Court of Appeals for the District of Columbia Circuit; Baltimore Gas and Electric Company, *et al.* were parties to that appeal as intervenor respondents.

II.

The Opinion Of The Court Of Appeals

On July 21, 1976, the United States Court of Appeals for the District of Columbia Circuit, in an opinion by Chief Judge Bazelon with Judge Tamm concurring in the result, held that the waste disposal and reprocessing portions of the rulemaking record did not evidence sufficient "ventilation" of those issues, and vacated and remanded those portions of the fuel cycle rule. *NRDC* v. *NRC,* 547 F.2d 633, 647, 655 (D.C. Cir. 1976), *App.* 28, 51-52, 71. Judge Bazelon also wrote a "Separate Statement" taking specific issue

[8] Environmental Survey of the Uranium Fuel Cycle (WASH-1248), April 1974 [reprinted in pertinent part at *App.* 1194-1339].

[9] The Uranium Fuel Cycle Rule has been codified at 10 C.F.R. § 51.20(e) (1977).

with the opinions expressed in Judge Tamm's concurrence and setting forth the philosophical underpinnings of the majority's approach to judicial review. 547 F.2d at 655-657, *App.* 72-77.[10]

So far as rulemaking procedures were concerned, the majority observed that respondents' "primary argument" below was that the Commission's decision to preclude " 'discovery or cross-examination' denied them . . . due process." 547 F. 2d at 643, *App.* 43. The majority was unable to find that the procedures used by the Commission were fundamentally unfair or that they did not comply with the requirements of the Atomic Energy Act of 1954, as amended, 42 U.S.C. § 2011 *et seq.* (1970 & Supp. V 1975) or the Administrative Procedure Act, 5 U.S.C. § 551 *et seq.* (1970 & Supp. V 1975) (APA).[11] Instead, it recast NRDC and CNI's procedural challenge. According to the majority, CNI's argument was "not that cross-examination was required *per se,*

[10] The court of appeals in its decision also remanded the reactor operating license which had been issued to Vermont Yankee Nuclear Power Corporation, petitioner in No. 76-419. The fuel cycle rulemaking and Vermont Yankee cases had been consolidated by the court of appeals for briefing and argument. On the same day the court of appeals decided the related case of Aeschliman v. NRC, 547 F.2d 622, App. 89 (D.C. Cir. 1976), which also involved, *inter alia,* the issue of the validity of an NRC reactor license issued to Consumers Power Company's Midland nuclear plant. Finally, on November 9, 1976 the court of appeals remanded *per curiam* an NRC license which had been issued pursuant to the fuel cycle rule to Long Island Lighting Company's Shoreham station. Lloyd Harbor Study Group, Inc. v. NRC, No. 73-2266 (D.C. Cir. Nov. 9, 1976) (*per curiam*). The petitions for certiorari filed on behalf of Vermont Yankee in the consolidated rulemaking-licensing case (No. 76-419), and on behalf of Consumers Power Company in its related *Aeschliman* case (No. 76-528), were consolidated by this Court when it granted certiorari. Petitions for certiorari filed by respondents Baltimore Gas and Electric Company, *et al.* from the fuel cycle rulemaking case (No. 76-548) and by Long Island Lighting Company from the related *Lloyd Harbor Study Group* case (No. 76-745) are presently pending before this Court.

[11] For brevity's sake, references to the APA will hereinafter be made to the United States Code section numbers.

but that the procedures utilized by the Commission were in the aggregate inadequate sufficiently to ventilate the issues." 547 F.2d at 644 n.25, *App.* 45 n.25.

Relying on this characterization, the majority went on to enunciate a new standard for judicial review of informal rulemaking. It stated that it must determine "whether the procedures provided by the agency were sufficient to ventilate the issues." 547 F.2d at 643, *App.* 44. The majority also suggested that fulfillment of an agency's responsibilities under the National Environmental Policy Act of 1969, 42 U.S.C. § 4321 *et seq.* (1970 & Supp. V 1975) (NEPA), might require the use of procedures beyond those traditionally employed in informal rulemaking. 547 F.2d at 645 & n.34, *App.* 48 & n.34.

Since the majority believed that assessment of "agency procedures requires that the reviewing court immerse itself in the record," 547 F.2d at 644-45, *App.* 47, it examined certain portions of the record to ascertain if issues were "ventilated" to its satisfaction.[12] The majority then indicated in some detail why it believed that there was "an insufficient record to sustain . . . the numerical values in Table S-3" relating to nuclear waste disposal. 547 F. 2d at 647-53, *App.* 52-66. It never, however, explained why it thought the considerable record on reprocessing was deficient. The majority's entire treatment of the matter consists of three repetitions of the term "reprocessing" (547 F. 2d at 647, 654, 655, *App.* 51-52, 67-68, 71), with neither discussion nor analysis of the relevant record or any weaknesses perceived in it.

[12] In response to an NRC motion to correct the opinion, the court, *per curiam,* deleted on October 8, 1976 each of the majority opinion's three emphatic but erroneous assertions that the Hearing Board, in its failure to ensure a fully "ventilated" record, had not conducted any examination of the NRC Staff's expert witness on waste management, Dr. Frank Pittman. *Compare* App. 61 (lines 3-5), 61 n.53, 68 n.59 *with* 547 F.2d at 651, 651 n.53, 654 n.58.

Having found certain deficiences which it believed showed the need for ventilation, the majority ordered "procedural devices" on remand in excess of those required by statute. 547 F.2d at 653-54, *App.* 67-68. The majority opined that perhaps a "more sensitive, deliberate" application of procedures used in the original rulemaking proceeding would suffice, 547 F.2d at 653-54, *App.* 67, but strongly implied that some special combination of adversarial procedures—which it listed—might be necessary to produce proper "ventilation." *Id.*[13] The majority also indicated the possibility that "no combination of the procedures mentioned above will prove adequate, and the agency will be required to develop new procedures. . . ." *Id.*

Judge Tamm, rejecting the majority's preoccupation with the use of adversarial procedures as inconsistent with decisions of this Court and likely to wreak havoc in the administrative process, found no merit in the majority's conclusions regarding rulemaking procedures. 547 F.2d at 658-61, *App.* 78-86.

III.
Events Since The Court Of Appeals' Decision

Since July 21, 1976, the Commission has undertaken a series of actions relative to its nuclear licensing responsibilities in light of the court of appeals' decision of that date.

The Commission's first step was to issue, on September 13, 1976, a General Statement of Policy (41 Fed. Reg. 34707). That document stated that the Commission would reopen the record of the uranium fuel cycle rulemaking on the issues of reprocessing and waste management and that

[13] The inventory of the majority's procedural catalogue included "informal conferences between intervenors and staff, document discovery, interrogatories, technical advisory committees comprised of outside experts with differing perspectives, limited cross-examination, funding independent research by intervenors, detailed annotation of technical reports, surveys of existing literature, [and] memoranda explaining methodology." 547 F.2d at 653, *App.* 67.

the Commission's staff had been directed to produce, on an expedited basis, an adequately documented revision to the Environmental Survey treating these issues. The General Statement of Policy also imposed a moratorium on the issuance of any operating licenses or construction permits pending issuance of an interim rule; reopened the *Vermont Yankee* and *Midland* operating license proceedings on various issues including the question whether these licenses should be continued, modified or suspended pending promulgation of an interim rule; and permitted requests to show cause why any other nuclear power plant licenses should not also be modified or suspended pending issuance of an interim rule.

On October 13, 1976 the Commission issued a notice announcing the availability of a revision to the portions of its previous Environmental Survey dealing with reprocessing and waste management. 41 Fed. Reg. 45849 (October 18, 1976). Concluding that the revision would be adequate to support issuance of an interim rule described in the notice, the Commission proposed to issue such a rule while proceedings directed toward promulgation of a revised final rule were going forward, and requested comment on this proposal. *Id.*

The Commission promulgated a Supplemental General Statement of Policy on November 5, 1976. 41 Fed. Reg. 49898 (November 11, 1976). In it the Commission announced that it would not initiate, *sua sponte,* show cause proceedings against reactor licensees on fuel cycle rule grounds, and that it was suspending show cause proceedings already in progress, pending issuance of an interim rule. The Commission also indicated that it would permit resumption of licensing on the basis of the fuel cycle values in effect on July 21, 1976 provided that use of values set forth in the proposed interim rule would not tilt the environmental cost-

benefit balance against the plant. One consideration in the Commission's decision was its confidence in the breadth and quality of the analysis in the revised Environmental Survey —whose values were not significantly different from those in the previous Environmental Survey and accompanying fuel cycle rule. 41 Fed. Reg. at 49899.

On March 7, 1977 the Commission issued its "final-interim" fuel cycle rule, indicating the treatment to be given fuel cycle issues in reactor licensings pending the completion of remand proceedings and issuance of a final revision to the fuel cycle rule. 42 Fed. Reg. 13803 (March 13, 1977). The values embodied in this "final-interim" rule were not significantly different from those contained in either the earlier proposed interim rule or the rule which had been vacated on July 21, 1976. The final interim rule was accompanied by a second revision to the Environmental Survey, which took into account and responded to the public comments received on the previous (October 1976) revision to the Environmental Survey.

Finally, on May 20, 1977 the Commission issued a notice of reopened rulemaking on the fuel cycle rule. 42 Fed. Reg. 26987 (May 26, 1977). The notice suggested consideration of the effects of alternative configurations of the uranium fuel cycle, in order to account for recent policy proposals by the President that the use of plutonium fuel in commercial reactors (and therefore the development of breeder reactors and the commercial use of reprocessing technology) be deferred.

SUMMARY OF ARGUMENT

When reviewing informal rulemaking, a court must engage in a substantive inquiry into the entire administrative record (1) to ascertain whether the agency has acted within

the scope of its authority, (2) to determine if all relevant factors were considered, (3) to make certain that the agency did not abuse its discretion, and (4) to ensure that the actual choices made were not arbitrary, capricious, or otherwise not in accordance with law. The procedural method by which the rulemaking record is actually developed, however, assuming compliance with statutory requirements, is ordinarily a matter within the discretion of the agency. Thus, even where a court finds a record inadequate and remands it for further proceedings, it may not, except in extraordinary circumstances, limit agency discretion as to the procedures to be followed in those proceedings. The majority below erroneously short-circuited these requirements in its review of the uranium fuel cycle rulemaking record and ignored these principles in remanding portions of that record on procedural grounds.

Agencies may, and often do, go beyond statutory procedural minima in rulemakings. And, in a number of recent informal rulemakings involving particularly complex factual questions, certain agencies have employed "hybrid" (mixed adjudicatory-legislative) procedures tailored to promote full disclosure and consideration of all relevant factors. However, the court below erred in holding that participants in rulemakings have a "right" to such procedures merely because the proceeding involves complex fact-policy issues or environmental considerations.

Finally, if a reviewing court finds an agency rulemaking record inadequate to support a challenged regulation, the regulation must be set aside and the record remanded. Unless a rulemaking participant has shown a special need for particular procedures over and above those required by statute, however, the agency on remand should be free to employ whatever procedures it deems appropriate so long as it considers all pertinent factors, fully responds to relevant substantive issues timely raised, and fully discloses the bases for its conclusions. No such showing of need for special procedures was made during the uranium fuel cycle rulemaking.

ARGUMENT

In recent years, administrative agencies have increasingly turned to rulemaking to resolve complex factual as well as policy issues.[14] This has been particularly evident in the emerging fields of energy and environmental regulation where disputes over policy are substantial, issues are factually complicated and technologically sophisticated, the affected interests are numerous, and the need for action is often compelling. In an effort to foster unusually well developed records in such rulemakings, certain agencies, including the NRC, have occasionally provided participants with procedures beyond those explicitly required by their organic statutes and the APA.

Until now, however, this Court has not had occasion specifically to address the proper standard for judicial review of such hybrid rulemakings, or to involve itself in their procedural mechanics. Prior decisions here have instead focused on the standard for review of and procedural requirements associated with informal agency action in more traditional settings, *e.g., Camp* v. *Pitts,* 411 U.S. 138 (1973); *Citizens to*

[14] While the choice between proceeding by general rule or individual adjudication to establish agency policy is one that lies primarily within the informed discretion of the agency, SEC v. Chenery Corporation, 332 U.S. 194, 203 (1947), the advantages of rulemaking over individual adjudication in the formulation of general regulations or agency policy have been recognized by this Court, agencies themselves, and various commentators. *E.g.,* United States v. Storer Broadcasting, 351 U.S. 192 (1956); NLRB v. Wyman-Gordon Co., 394 U.S. 759 (1969); Statement of Basis and Purpose of Trade Regulation Rule, 29 Fed. Reg. 8325, 8365-8369 (1965); Robinson, *The Making of Administrative Policy: Another Look at Rulemaking and Adjudication and Administrative Procedure Reform,* 118 U. Pa. L. Rev. 485 (1970).

Preserve Overton Park, Inc. v. *Volpe,* 401 U.S. 402 (1971); *United States* v. *Florida East Coast Railway Co.,* 410 U.S. 224 (1973); *United States* v. *Allegheny-Ludlum Steel Corp.,* 406 U.S. 742 (1972).

A number of the courts of appeals, on the other hand, have examined the standard for review of and procedural requirements associated with these complex fact-policy rulemakings in emerging areas of regulation.[15] Generally, those courts have applied the standard of review for informal agency rulemaking set forth in the APA and decisions of this Court.[16] They have also required rigorous compliance with statutory procedural requirements. But, unlike the court below, they have not required more, in the absence of a particularized showing of necessity during the proceeding before the Agency.[17] Nor, prior to the decision below, has any court indicated that NEPA contains requirements for rulemaking procedures more extensive than those otherwise required by the agency's organic statute, the APA or constitutional considerations of fundamental fairness.

I.

On Appeal Of Informal Rulemaking, A Court Must Engage In A Substantive Inquiry Into The Adequacy Of The Rulemaking Record, But May Not Substitute Its Judgment For That Of The Agency

Stripped of its rhetoric, the standard of review pronounced by Judge Bazelon, writing for the majority below, can be

[15] *E.g.,* Ethyl v. EPA, 541 F.2d 1 (D.C. Cir.) (en banc), *cert. denied,* 426 U.S. 941 (1976); Portland Cement Ass'n. v. Ruckelshaus, 486 F.2d 375 (D.C. Cir. 1973), *cert. denied,* 417 U.S. 921 (1974); Mobil Oil Corp. v. FPC, 483 F.2d 1238 (D.C. Cir. 1973); International Harvester Co. v. Ruckelshaus, 478 F.2d 615 (D.C. Cir. 1973).

[16] *E.g.,* Bowman Transportation, Inc. v. Arkansas-Best Freight Sys., Inc., 419 U.S. 281, 286 (1974); Camp v. Pitts, 411 U.S. at 141-43; *Overton Park,* 401 U.S. at 416.

[17] *See* text 29-30 *infra* & accompanying notes.

quickly summarized. Courts are "institutionally incompetent" to engage in substantive review of factually complex and technically sophisticated rulemaking and they should not attempt to do so. *NRDC* v. *NRC,* 547 F.2d at 657, *App.* 76 (separate statement of Bazelon, C.J.). Instead, they should concentrate their efforts on requiring of agencies "innovative" procedural formats "to improve the quality of decisionmaking." *Id.* And, if the procedures employed by the agency are not to the court's liking, the record must be remanded and the agency compelled to provide procedures on remand in excess of those required by statute.[18] This approach is inconsistent with the standard for judicial review of informal rulemaking set forth in section 706 of the APA, 5 U.S.C. § 706 (1970).

Section 706 of the APA provides that a court must set aside informal[19] "agency action, findings, and conclusions" that are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law," that are "in excess of statutory jurisdiction, authority, or limitations, or short of statutory right," or that are "without observance of procedure required by law." 5 U.S.C. § 706(2)(A), (C) & (D)

[18] While the opinion below is rife with statements indicating that the procedures employed by the Commission must provide for sufficient "ventilation" of the issues and "dialogue" between the agency and participants in the rulemaking, *see, e.g.,* NRDC v. NRC, 547 F.2d at 643, 644, 646, 653, App. 44, 46, 49-50, 67, the judicial philosophy underlying these statements is most clearly set forth in Judge Bazelon's separate opinion. Indeed, the separate opinions of both Judges Bazelon and Tamm underscore the majority's preoccupation with extrastatutory procedures as a kind of *deus ex machina* in rulemaking.

[19] Although the terms "informal" and "formal" agency action are not defined by the APA, this Court has termed "informal" any agency action not required by statute to be based "on the record" after opportunity for hearing. *See Allegheny-Ludlum,* 406 U.S. at 757-58. Conversely, agency action subject to an "on the record" requirement is "formal" action. Thus, whether rulemakings are "formal" or "informal" agency action depends primarily upon their statutory origin.

(1970). The court must engage in a "substantial inquiry" to ascertain whether these three standards have been met. *Overton Park,* 401 U.S. at 415. And, while a presumption of regularity attaches to agency action, the court should not hesitate to undertake a "thorough, probing and in-depth" review of the rulemaking record. *Id.* If the review demonstrates that the agency acted beyond the scope of its authority,[20] failed to resolve the substantive issues before it in a rational fashion, or ignored statutory procedural requirements, then the agency action must be set aside.[21]

When determining whether an agency has resolved the substantive issues before it in a rational fashion, "the court must consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment." *Overton Park,* 401 U.S. at 416.[22]

[20] There is no dispute here as to whether the Commission acted within the scope of its statutory authority in promulgating Table S-3. The Atomic Energy Act grants the Commission broad power to promulgate regulations "necessary to carry out the purposes" of the Act, 42 U.S.C. § 2201p (1970). As the court below recognized, the Commission clearly has authority under NEPA to resolve questions involving the environmental impacts of the uranium fuel cycle by rulemaking rather than individual adjudication. NRDC v. NRC, 547 F.2d at 641 n.17, *App.* 39-40 n.17; *see* Kleppe v. Sierra Club, 427 U.S. 390 (1976).

[21] These three provisions are "separate standards," and to be lawful, informal agency action must comply with all of them. *Overton Park,* 401 U.S. at 413.

[22] Thus, for a rule to have adequate support in the record the agency must have before it information on all relevant factors, give serious consideration to those factors, and present a reasoned explanation of its progress from its initial assumptions to its final conclusions, in light of those factors. The agency must articulate a rational connection between the facts found and the choices made. *Bowman Transportation,* 419 U.S. at 285. Conversely, it would be "arbitrary" or "capricious" for an agency not to take "into account all relevant factors" in making its decision. Hanly v. Mitchell, 460 F.2d 640, 648 (2nd Cir. 1972). And, while agency action will be upheld if the "agency's path may reasonably be discerned," the court "may not itself supply a reasoned basis for the agency's action that the agency has not given." *Bowman Transportation,* 419 U.S. at 485-86, *citing* Colorado Interstate Gas Co. v. FPC, 324 U.S. 581, 595 (1945) and SEC v. Chenery Corp., 332 U.S. 194, 196 (1947).

But the court in evaluating the record may not substitute its judgment for that of the agency. *Id., Bowman Transportation, Inc.* v. *Arkansas-Best Freight System, Inc.,* 419 U.S. at 285-86.

In other words, the standards set forth in section 706 of the APA do not require the courts to steep themselves in the technical merits of each agency decision they review. But they do require a court to make a searching and careful examination of the fact finding, fact predicting and factual reasoning processes which led the agency to adopt a particular rule in order to ensure that the agency fulfilled its obligation to give serious consideration to all reasonable contentions and evidence pertinent to the proposed regulation before it. *See City of Chicago* v. *FPC,* 458 F.2d 731, 742-43 (D.C. Cir. 1971), *cert. denied,* 405 U.S. 1074 (1972).

The opinion of the majority below makes clear that it paid little attention to these requirements of section 706. Instead of engaging in substantive review of the adequacy of the fuel cycle rulemaking record, the court examined the procedures employed by the Commission to see if they were sufficient to "ventilate" issues which it, but not necessarily the Commission, deemed critical.[23]

[23] Judge Bazelon's concerns about the "institutional incompetency" of judges to engage in substantive review are simply not borne out by past judicial efforts. Indeed, they stand in marked contrast to the en banc opinion of the District of Columbia Circuit in Ethyl v. EPA, 541 F.2d 1 (D.C. Cir.), *cert. denied,* 426 U.S. 941 (1976):

> There is no inconsistency between the deferential standard of review and the requirement that the reviewing court involve itself in even the most complex evidentiary matters; rather, the two indicia of arbitrary and capricious review stand in careful balance. . . . The enforced education into the intricacies of the problem before the agency is not designed to enable the court to become a superagency that can supplant the agency's expert decision-maker. To the contrary, the court must give due deference to the agency's ability to rely on its own developed expertise. Market St. Ry. v. Railroad Comm'n, 324 U.S. 548, 559-561 (1945). The immersion in the evidence is designed *solely* to

The untenability of this substitution of procedural for substantive review is reflected in the majority's rather cavalier treatment of the reprocessing portion of the rulemaking record. The record of the fuel cycle rulemaking contains extensive testimony, comments and other information on the subject of the environmental effects of reprocessing.[24] Yet nowhere in the majority opinion does the court explain the basis of its conclusion that the reprocessing record is inadequate or even identify a single deficiency in that part of the record. Apparently, the majority believed it had no obligation to point out any such deficiencies. Under the majority's theory of review it needed only to find that the procedures used in the rulemaking did not fully "ventilate" certain issues regarding waste disposal in order to remand the entire

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> enable the court to determine whether the agency decision was rational and based on consideration of the relevant factors. Citizens to Preserve Overton Park v. Volpe, 401 U.S. at 416; Bowman Transportation, Inc. v. Arkansas-Best Freight Sys., Inc., 419 U.S. at 285, 290.

541 F.2d at 36 (citations conformed) (emphasis in original).

[24] *See, e.g.*, Environmental Survey F-1 to -41, *App.* 580-609; WASH-1248, *supra* n.8, F-1 to -40, *App.* 1243-91; Tr. 84-86, 130-38, 244-50, 312-20, 412-15, 484-85, *App.* 766-68, 811-17, 864-68, 916-22, 965-68; General Electric Company, Comments on the Supplementary Comments by the Union of Concerned Scientists 1-2 (undated), *App.* 1153; State of New York, Comments on the Environmental Survey 2-8 (January 18, 1973), *App.* 648-54; General Electric Company, Supplemental Written Statement 5-7 (March 1, 1973), *App.* 1028-30; Staff Summary Comments on Proceeding for Environmental Effects of the Uranium Fuel Cycle 43-52 (March 19, 1973), *App.* 1058-64; CNI-UCS Supplementary Comments 3.1-3.50 (March 19, 1973), *App.* 1108-51; New York State Atomic Energy Council Comments on the Supplementary Comments by the Union of Concerned Scientists 1-6 (April 13, 1973), *App.* 1155-61; Response of 14-Member Utility Group to "Supplementary Comments" of CNI-UCS 6-21 (April 13, 1973), *App.* 1172-85; Nuclear Fuel Services, Inc. Response to Union of Concerned Scientists 1-7 (April 16, 1973), *App.* 1186-92.

record on both waste disposal and reprocessing to the agency.[25]

In other words, the majority's theory of judicial review sanctions remand of an administrative record as inadequate without identification of those areas which must be corrected or supplemented. Unless this theory is rejected by this Court, more such remands could result. The courts of appeals must not be permitted to substitute review of the procedures utilized in a rulemaking for a thorough review of the adequacy of the rulemaking record.[26].

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[25] The fact that an agency, on remand, must follow the dictates of the reviewing court, FCC v. Pottsville Broadcasting Co., 309 U.S. 134, 145 (1940), carries with it the necessary implication that reviewing courts must be specific in their directions to the agency. Other courts have consistently met this responsibility by clearly identifying those areas of the record in which further information or explanation is needed. *E.g.*, Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 388, 394, 398, 399 (D.C. Cir. 1973), *cert. denied*, 417 U.S. 921 (1974); Kennecott Copper Corp. v. EPA, 462 F.2d 846, 850 (DC. Cir. 1971); Carnevale v. Gardner, 393 F.2d 889, 891 (2d Cir. 1968). By not explaining the grounds for its remand of the reprocessing part of the Uranium Fuel Cycle Rule, the court has, therefore, failed to fulfill its obligation to the Commission.

Moreover, blanket remands without any articulation can only lead to unnecessary delay in the administrative process. Not only will agencies on remand be unable to narrow their attention to particular areas of concern but, if an agency guesses wrong, the court may remand the rule again to correct a deficiency it could have easily identified at the outset. This Court should make clear that a reviewing court has the obligation to articulate the grounds for its decisions so that those affected by them will be able to respond in an expeditious and efficient manner.

[26] In remanding without explanation, the court of appeals also failed to fullfill its obligation to provide this Court with an adequate basis for appellate review. As the Tenth Circuit recently observed:

> Here, the district court concluded that agency action was arbitrary and capricious, but . . . [it did not offer any] statement of which facts in the administrative record, or the absence thereof, were relied on in reaching its conclusion.
>
> With basis for the district court's disposition of the matter obscure, proper appellate review is precluded.

Hill v. Morton, 525 F.2d 327, 328 (10th Cir. 1975).

II.
The Procedural Holdings Of The Court Of Appeals Are Without Foundation In The Atomic Energy Act, The APA Or NEPA

Having found that issues involving the waste management and reprocessing portions of the fuel cycle rule were not, in its judgment, sufficiently "ventilated," the court remanded those portions of the rule to the Commission and directed further proceedings with additional procedures beyond those specified in the Atomic Energy Act or the APA.[27] The majority's belief that such procedures are required *per se* either by NEPA or by the complex nature of the fuel cycle rulemaking is without foundation.[28] Similarly, the majority's pro-

[27] The majority proposed an entire litany of additional procedures for the Commission's consideration, *see* note 13 *supra*. However, the court stopped short of directly ordering the Commission to choose from among these procedures by speculating that perhaps "the procedures the agency adopted in this case, if administered in a more sensitive, deliberate manner, might suffice." NRDC v. NRC, 547 F.2d at 653-54, *App.* 67. Of course this statement in itself has the effect of *requiring* procedures on remand which exceed those mandated by the Atomic Energy Act and the APA, since the procedures used by the Commission already went beyond statutory requirements. In any event, the court made certain its point would not be lost on the Commission: "It may be that no combination of the procedures mentioned above will prove adequate, and the agency will be required to develop new procedures. . . ." *Id. See also id.* at 658, *App.* 79 (Tamm, J, Separate statement concurring in result): "The majority appears to require the Commission to institute further procedures of a more adversarial nature than those customarily required for informal rulemaking by the Administrative Procedure Act . . . ."

[28] The implication of the majority below that extrastatutory rulemaking procedures will somehow automatically result in an "adequate record" indicates serious confusion as to the nature of the administrative record to be reviewed by the court. The uranium fuel cycle rulemaking proceeding was clearly "informal" agency action. *See* note 29 *infra*. Review of informal rulemaking "is to be based on the full administrative record" that was before the agency when it made its decision. *Overton Park,* 401 U.S. at 420. It is not to be limited to information contained in the transcript of a hearing held by the agency. Pacific Coast European Conference v. United States, 350 F.2d 197, 205 (9th Cir.), *cert. denied*, 382 U.S. 958 (1965). Thus, the ade-

cedural directives for the remand proceeding conflict with holdings of this Court and the courts of appeals which require a showing of substantial need for such procedures by participants during the rulemaking proceeding.

A. The Procedures Used In The Uranium Fuel Cycle Rulemaking Satisfied The Requirements Of The Atomic Energy Act, The APA And NEPA

Recognizing that neither the Atomic Energy Act nor the APA expressly required procedures even as extensive as those provided to participants in the Uranium Fuel Cycle rulemaking,[29] the majority below sought to find support in NEPA for its procedural holdings. Thus, the majority stated that

quacy of the record of an informal rulemaking depends not so much on the procedures afforded participants at a hearing the agency might hold as on whether the agency has considered all of the relevant factors, examined all of the available information and disclosed that information to the public. *See text* 24-28 *infra* & accompanying notes.

[29] In interpreting the hearing requirements of the Atomic Energy Act, the District of Columbia Circuit in Siegel v. AEC, 400 F.2d 778 (D.C. Cir. 1968), observed that:

> [s]ection 2239(a) [189(a)] of the Atomic Energy Act does not, in its reference to a hearing, distinguish in terms between adjudicatory and rule-making proceedings. . . . In neither kind of proceeding does the statute say explicitly that that hearing must be on the record. The Commission has, however, invariably distinguished between the two, and has provided formal hearings in licensing cases, as contrasted with informal hearings in rulemaking proceedings confined to written submission and nonrecord interviews. . . .

400 F.2d at 785. As a result, the court in *Siegel* held that the rulemaking hearing required by the Atomic Energy Act was satisfied by compliance with section 553 of the APA and that the Commission need not employ the procedures of sections 556 and 557 of that statute. 400 F.2d at 785-86, *cited with approval in Allegheny-Ludlum,* 406 U.S. at 757; *see also Florida East Coast Ry.,* 410 U.S. at 226-28. Thus, the Commission was required by the Atomic Energy Act and the APA to afford participants in the fuel cycle rulemaking only those procedures specified in section 553 of the APA. Nonetheless it provided procedures which clearly went beyond those requirements.

agencies may be required to "develop new procedures to accomplish the innovative task of implementing NEPA through rulemaking." *NRDC* v. *NRC*, 547 F.2d at 653, *App.* 67. This assertion is without support in NEPA or decisions of this and lower courts.

NEPA contains no requirement that an agency hold hearings on the environmental consequences of its proposed actions. *Lathan* v. *Brinegar*, 506 F.2d 677, 689 (9th Cir. 1974); *National Helium Corp.* v. *Morton*, 455 F.2d 650, 657 (10th Cir. 1971). *See Aberdeen & Rockfish RR. Co.* v. *SCRAP*, 422 U.S. 289 (1975) (*SCRAP II*). All it requires procedurally is that once an impact statement is prepared it must then follow the "existing agency review processes." 42 U.S.C. § 4332(2)(C) (1970). Of course, a hearing may be a part of an "existing agency review process," and while participants in such hearings should be afforded the same procedural rights with respect to NEPA issues as they are with respect to other issues, they need not be afforded more. *See Calvert Cliffs' Coord. Comm.* v. *AEC*, 449 F.2d 1109, 1122-23 (D.C. Cir. 1971); *Greene County Planning Bd.* v. *FPC*, 455 F.2d 412, 422 (2d Cir. 1972); *see also, SCRAP II*, 422 U.S. at 320; *Cf. Kleppe* v. *Sierra Club*, 427 U.S. 390, 405-06 (1976).

The majority's reliance on the complex nature of the fuel cycle rulemaking as a prop to support its statements concerning the need for extrastatutory procedures is similarily misplaced. The majority's fascination with the use of "innovative" procedural formats in complex rulemakings demonstrates little understanding of the requirements of section 553 of the APA. That section sets forth procedures which, if complied with fully, will ordinarily be sufficient to ensure both agency consideration of "all relevant factors" and development of a record sufficient for judicial review under section 706.

Section 553 of the APA requires an agency to give public notice of "the legal authority under which the rule is proposed" and of "either the terms of the substance of the proposed rule or a description of the subjects and issues involved." 5 U.S.C. § 553(b) (1970). The agency must provide "interested persons an opportunity to participate in the rulemaking through submission of written data, views, or arguments with or without opportunity for oral presentation." 5 U.S.C. § 553(c) (1970). Finally, after "consideration of the relevant matter presented" the agency must "incorporate in the rules adopted a concise general statement of their basis and purpose." *Id.*[30]

The brevity of section 553 does not leave it without force. To the contrary, its three broad procedural requirements encompass stringent substantive responsibilities designed to assist judicial review as well as to provide fair treatment for persons affected by a rule.

The courts have recognized that the notice provision of section 553 imposes on agencies a standard of full disclosure and that an agency must to the best of its ability clearly articulate in the notice of proposed rulemaking the facts and assumptions on which it intends to rely.[31] *Portland Cement*

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[30] In certain situations oral hearings may also be a vital part of the informal rulemaking process. American Airlines v. CAB, 359 F.2d 624, 632 (D.C. Cir. 1966), *cert. denied*, 385 U.S. 843 (1966). Whether such hearings are required by due process, however, varies from case to case in accordance with differing circumstances. FCC v. WJR, The Goodwill Station, 337 U.S. 265, 276 (1949).

[31] Of course, this notice requirement "does not automatically generate a new opportunity for comment merely because the rule promulgated by the agency differs from the rule it proposed." *International Harvester*, 478 F.2d at 632 & n. 51. Nevertheless, since an obvious prerequisite to the ability to make meaningful comment is to know the basis on which the rule is proposed, agencies should be held to full and rigorous compliance with section 553(b). *See Portland Cement*, 486 F.2d at 392-93.

Ass'n v. *Ruckelshaus,* 486 F.2d 375, 392-94 (D.C. Cir. 1973), *cert. denied,* 417 U.S. 921 (1974); *see International Harvester,* 478 F.2d at 649. Thus, if empirical predictions constitute a substantial basis for agency action, the agency's predictive methodology must be set forth so that interested participants have an opportunity to study and challenge it. *See Portland Cement,* 486 F.2d at 392; *Mobil Oil Corp.* v. *FPC,* 483 F.2d 1238, 1251 n. 39 (D.C. Cir. 1973); *International Harvester,* 478 F.2d at 649.

The full disclosure requirement of the notice provision of section 553 was clearly complied with in the uranium fuel cycle rulemaking. The original notice of proposed rulemaking fully set forth the background to the Commission's proposed action and two alternative proposals, provided for a 60-day period for submission of comments, and gave notice of the oral hearing at which all interested members of the public were invited to submit additional statements. 37 Fed. Reg. 24191 (1972), *App.* 352. Indeed, no participant in the rulemaking proceeding has claimed that the agency failed to disclose adequately the nature and purpose of the Uranium Fuel Cycle Rule.

The full disclosure responsibility implicit in the notice requirement of section 553 is made explicit in the provisions of that section requiring a "concise general" statement of "basis and purpose." Although detailed findings of fact are not necessary, *see Camp* v. *Pitts,* 411 U.S. at 141-2 & n. 3, that statement cannot be so "concise" and "general" as to be merely conclusory. Thus, the agency must provide reasoned explanations for each of its specific determinations. *See Pillai* v. *CAB,* 485 F.2d 1018, 1023-31 (D.C. Cir. 1973).[32]

[32] If the statement of basis and purpose is so inadequate as to "frustrate effective judicial review," the remedy is for the court to remand to the agency to obtain additional explanation of the reasons for the agency decision. Camp v. Pitts, 411 U.S. at 142-43. Of course, the explanation supplied by the agency on remand may not be simply a "post-hoc rationalization" for action that was essentially arbitrary when taken. See Burlington Truck Lines v. United States, 371 U.S. 156, 168-9 (1962). On the other hand, if after a thorough review of the full administrative record the court determines that the agency has failed to disclose fully the bases of its action, that substantive issues were raised by participants but not addressed by the agency or that the action taken is "not sustainable on the administrative record" made, the regulation must be set aside and the proceeding remanded to the agency for further action. Camp v. Pitts, 411 U.S. at 142-3; *Overton Park,* 401 U.S. at 420.

Moreover, the opportunity to comment is meaningless unless the agency responds to significant points raised by participants before it. *Portland Cement,* 486 F.2d at 393-94.[33] At a minimum, therefore, the statement of basis and purpose must refer to relevant submissions by participants and rebut or accept those submissions in an orderly and reasoned fashion.[34]

The Commission also fully complied with this requirement. The statement of basis and purpose accompanying the fuel

[33] Contrary to Judge Bazelon's suggestion, NRDC v. NRC, 547 F.2d at 657, *App.* 76, the necessity of enforcing this obligation imposes no hardship on the courts. In determining what issues raised by participants in a rulemaking are significant, the "arbitrary and capricious" standard should be employed. Thus, only comments which, if true, raise points relevant to the agency's decision and which, if adopted, would require a change in the agency's proposal need be responded to by the agency. Comments which are purely speculative or do not disclose the factual basis on which they rely should require no response. *See Portland Cement,* 486 F.2d at 393-94.

[34] *See* Automotive Parts & Accessories Ass'n v. Boyd, 407 F.2d 330, 338 (D.C. Cir. 1968):

> [The statement of basis and purpose] . . . must be accommodated to the realities of judicial scrutiny, which do not contemplate that the court itself will, by a laborious examination of the record, formulate in the first instance the significant issues faced by the agency and articulate the rationale of their resolution. . . . [The record must] enable . . . [the court] to see what major issues of policy were ventilated by the informal proceedings and why the agency reacted to them as it did.

Accord, National Nutritional Foods Ass'n v. Weinberger, 512 F.2d 688, 701 (2d Cir.), *cert. denied,* 423 U.S. 827 (1975).

cycle rule addressed each substantive issue that had been raised in the rulemaking proceeding. And, in each instance the Commission set forth in detail the reasons for the final action which it took. *App.* 385-400.

In summary, section 553 of the APA provides a framework suitable for even sophisticated rulemakings without need for automatic resort to special procedural devices. The notice, comment, and statement of basis and purpose requirements of section 553 were fully complied with in the fuel cycle rulemaking. The court below therefore erred in invoking the complex nature of the issues present in that proceeding as a justification for demanding special procedures.

B. Absent Substantial Justification, A Court On Remanding For Further Action May Not Prescribe Procedures In Excess Of Those Required By Statute

The Court has recently had occasion to reaffirm the proper role of a reviewing court when remanding action found unsupported by the record before it.

> At least in the absence of substantial justification for doing otherwise, a reviewing court may not, after determining that additional evidence is requisite for adequate review, proceed by dictating to the agency the methods, procedures, and time dimension of the needed inquiry and ordering the results to be reported to the court without opportunity for further consideration on the basis of the new evidence by the agency. Such a procedure clearly runs the risk of "propel[ling] the court into the domain which Congress has set aside exclusively for the administrative agency." SEC v. Chenery Corp. 332 U.S. 194, 196 (1947).

FPC v. *Transcontinental Gas Pipe Line Corp.*, 423 U.S. 326, 333 (1976).

The majority below, while feinting in the direction of this

Court's holding in *Transcontinental Gas,* nonetheless proceeded to direct the use of extrastatutory procedures on remand without any justification, much less "substantial justification," for such procedures having been demonstrated during the rulemaking proceeding. In doing so the majority purportedly relied on a line of decisions which have indicated that a rulemaking participant may, in certain situations, challenge procedures which meet statutory minima but which nonetheless deny due process[35] or are inadequate to ensure the full disclosure necessary to develop an adequate record. *E.g., International Harvester Co.* v. *Ruckelshaus,* 478 F.2d 615 (D.C. Cir. 1973); *American Airlines, Inc.* v. *CAB,* 359 F.2d 624 (D.C. Cir. 1966), *cert. denied,* 385 U.S. 843 (1966). This reliance is misplaced.

The cases cited by the court below, *NRDC* v. *NRC,* 547 F.2d at 643 n. 23, *App.* 43 n. 23 recognize that the complexities of modern rulemakings have placed greater burdens on the agencies, and ultimately on reviewing courts, to ensure compliance with substantive and procedural statutory obligations. At the same time, however, these decisions have made clear that in order to sustain a "due process" or "record" challenge to agency procedures, a participant during the rulemaking proceeding must make "circumscribed and justified requests" for additional procedures and the request must demonstrate that on "critical points . . . the general procedure . . . [is] inadequate to probe 'soft' and sensitive subjects." *International Harvester,* 478 F.2d at 631; *see also South Terminal Corp.* v. *EPA,* 504 F.2d 646 (1st Cir. 1974).

In other words, courts have not acceded to demands for special rulemaking procedures unless the petitioner has previ-

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[35] This Court has recognized that when an agency is called upon to make a "quasi-judicial" determination in rulemaking additional procedures *may* be required by "due process" considerations. *Florida East Coast Ry.,* 410 U.S. at 242-45.

ously made to the agency a showing of substantial justification. This showing must consist of a demonstration that reliance on minimum statutory procedures alone would be fundamentally unfair,[36] that the agency would abuse its discretion by denying a request for additional procedures likely to improve significantly the quality of a critical portion of the record, or that a particular procedure is necessary to ensure the full disclosure mandated by the APA.[37]

In this case, the NRC employed rulemaking procedures which went beyond those required by the Atomic Energy Act or APA. CNI and NRDC alleged that these procedures were flawed because the Commission had not provided across-the-board rights to formal discovery and cross-examination. App. 844.[38] But they failed even to attempt to de-

[36] It should be noted that procedural due process problems are more likely to arise in situations where an agency uses informal rulemaking procedures in promulgating standards which govern individual conduct but are not subject to case-by-case waivers. *Cf.* Weinberger v. Hynson, Westcott & Dunning, 412 U.S. 609, 638 n. 1 (1973) (Powell, J. concurring); United States v. Storer Broadcasting Co., 351 U.S. 192, 205 (1956). For example, EPA, in adopting the criminally enforceable new source performance standards under section 306 of the Federal Water Pollution Control Act, 33 U.S.C. §1316 (Supp. V 1975), may not include in those standards a provision for waiver or variance. DuPont v. Train, 45 U.S.L.W. 4212, 4219 (U.S. Feb. 23, 1977). By contrast, all substantive rules of the NRC are subject to waiver on a case-by-case basis under 10 C.F.R. § 2.758 (1977).

[37] The court in *International Harvester* apparently found such "substantial justification" since it rejected petitioners' broad-based procedural challenges but still ordered the agency to provide, on remand, a limited opportunity for cross-examination. 478 F.2d at 649. There, however, rulemaking participants, through their submittals, had developed a detailed record which challenged the agency's conclusions and left the court "uncertain" whether the agency had correctly resolved several complex technical issues which were critical to achieving the substantive result intended by Congress. *Id.*

[38] The court below transmuted respondents' sweeping demands for cross-examination and discovery to the more diffuse allegation "that the procedures utilized by the Commission were in the aggregate inadequate. . . ." NRDC v. NRC, 547 F.2d at 644 n. 25. *App.* 45 n. 25.

velop a record upon which the court could conclude that the procedures employed by the Commission were unfair or that cross-examination or any other special adversarial procedure was needed to ensure full disclosure or significantly improve the record.[39] The majority, ignoring this failure, simply declared the *International Harvester* test for substantial justification for additional procedures to have been met. *NRDC* v. *NRC*, 547 F.2d at 643-44 n. 25, *App.* 44-45 n. 25. It was not.[40]

CNI and NRDC made no attempt at the hearing to identify specific waste disposal issues which, in their view, required cross-examination for adequate exploration. Moreover, although their rulemaking submissions identified two

See text 7, 10 *supra*. The majority then proceeded to examine the fuel cycle rulemaking record on the basis of this argument which was never made to the Hearing Board or the Commission but instead was fashioned by the court of appeals itself long after the rulemaking proceeding had ended.

[39] As the Commission stated when it promulgated the Uranium Fuel Cycle Rule:

> All parties were fully heard. Nothing offered was excluded. The record does not indicate that any evidentiary material would have been received under different procedures. Nor did the proponent of the strict "adjudicatory" approach make an offer of proof—or even remotely suggest—what substantive matters it would develop under differen[t] procedures.

39 Fed. Reg. 14188, 14189 (1974), App. 385, 389. CNI's failure to make a showing of need for additional procedures occurred in the face of repeated warnings by other participants, at the oral hearings and in written submissions to the Hearing Board, that the burden for such specification was upon CNI. *See* text 7 & note 5 *supra*.

[40] The statement by counsel for CNI and NRDC at the oral hearing, relied upon by the majority, merely recited their demands for an across-the-board right to cross-examination and commented generally on the testimony of Dr. Frank Pittman, the Regulatory Staff's witness on waste disposal matters, as follows:

> we are not satisfied with Mr. Pittman's well intentioned, but, we think, not at all well explained position with regard to the ability to handle nuclear wastes for hundred of thousands of years. . . .

NRDC v. NRC, 547 F.2d at 643-44 n. 25, *App.* 44-45 n. 25; Tr. 208, *App.* 837.

"examples" of subjects which, they asserted, did require cross-examination, these submissions evinced no concrete effort to identify and develop whatever inadequacies CNI and NRDC may have thought to exist in the testimony of Dr. Pittman and others.[41] Nor did CNI and NRDC attempt to show how the resolution of any specific factual issues of criti-

[41] CNI and NRDC's only tangible attempt to show the need for cross-examination is found at page 26 of their "Statement with Respect to Legal Considerations," filed with the Board on March 2, 1973, a month after completion of the oral hearing. There, two brief portions of hearing dialogue were cited as evidence that "pervasive cross-examination" was a prerequisite to building an adequate record. Both colloquies involved questions put by Board members to the Regulatory Staff which, CNI and NRDC contended on appeal, were not completely answered. The first concerned standards applied by the Bureau of Mines and state governments, matters of only tangential pertinence to the rulemaking. Tr. 308-12, *App.* 912-16. The second related to calculations in the Environmental Survey. One Board member, Dr. John C. Geyer, requested data underlying certain statements made in the Environmental Survey, Tr. 121-28, *App.* 804-10; the Regulatory Staff witness' failure to respond fully prompted another Board member, Dr. J. J. Steindler, to comment later that there might well have been no need for Dr. Geyer's questions had these portions of the Survey been more fully documented. Tr. 139, *App.* 818. In their "Statement with Respect to Legal Considerations," CNI and NRDC asserted that cross-examination was necessary to obtain the data sought by Dr. Geyer. In fact, these data were fully supplied by the Regulatory Staff in its posthearing "Staff Summary Comments on Proceeding for Environmental Effects of the Uranium Fuel Cycle" (March 19, 1973). (The portions of that document dealing with reprocessing and waste management are reprinted at *App.* 1058-1066.) Since respondents never commented substantively on this issue, declining to avail themselves of the Hearing Board's direction to use supplementary comments "to highlight and point up the problems, and the questions . . . raised in the written and oral presentations of the other participants" (Tr. 6, *App.* 660) and since CNI and NRDC did not comment on the data supplied in the Regulatory Staff's "Summary Comments" (as Baltimore Gas and Electric Co., *et al*, and other participants did on CNI's comments), the episode stands not as a brief for cross-examination but rather as a paradigm both of the adequacy of the agency's procedures and of CNI and NRDC's failure to attempt to use them.

cal importance would be dependent upon the use of any special procedure or procedures."[42]

To the contrary, as the court recognized, CNI and NRDC's principal concerns involved "philosophical issues," not factual issues. 547 F.2d at 652, *App.* 63. While additional adversarial opportunities may under certain circumstances be required to resolve complex factual matters, it is difficult to understand how such procedures are required to resolve "philosophical issues." In short, there was no justification, let alone substantial justification, for the court's order for special procedures on remand.[43]

It follows that the decision below contravenes the holdings of this and other federal courts which recognize that, in reviewing the adequacy of a rulemaking record, the court's function is to determine whether the agency has adequately set out the basis for its action. If it has not, the court can remand to the agency to supply the missing information. In remanding, however, the court cannot, absent "substantial justification for doing otherwise," dictate "the methods [or] procedures" for remedying the record. *Transcontinental Gas,* 423 U.S. at 333.

[42] The court iself recognized that, with respect to their principal procedural demand, CNI and NRDC "did not show that . . . issues could not be explored except through cross-examination; nor did they attempt such a showing . . . ." 547 F. 2d at 644 n.25, *App.* 45 n.25.

[43] Thus, both the state of the record and the nature of CNI and NRDC's participation in the rulemaking below clearly distinguish this case from *International Harvester.* Rather, the circumstances here are similar to those in *South Terminal.* There, the court found the agency record inadequate and remanded for further proceedings even though the petitioners in that case, like CNI and NRDC, had done little or nothing to cure the record's inadequacies. 504 F. 2d at 665-66. On remand, the court required only that the agency's proceedings satisfy the minimum requirements of its organic statute and section 553 of the APA. *Id.* at 666-67.

CONCLUSION

For the foregoing reasons the decision of the court below should be reversed.

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STATUTES AND REGULATIONS INVOLVED

1. Administrative Procedure Act §§ 4, 10(e), 5 U.S.C. §§ 553, 706 (1970)

§ 553. RULE MAKING.

(a) This section applies, according to the provisions thereof, except to the extent that there is involved—

(1) a military or foreign affairs function of the United States; or

(2) a matter relating to agency management or personnel or to public property, loans, grants, benefits, or contracts.

(b) General notice of proposed rule making shall be published in the Federal Register, unless persons subject thereto are named and either personally served or otherwise have actual notice thereof in accordance with law. The notice shall include—

(1) a statement of the time, place, and nature of public rule making proceedings;

(2) reference to the legal authority under which the rule is proposed; and

(3) either the terms or substance of the proposed rule or a description of the subjects and issues involved.

Except when notice or hearing is required by statute, this subsection does not apply—

(A) to interpretative rules, general statements of policy, or rules of agency organization, procedure, or practice; or

(B) when the agency for good cause finds (and incorporates the finding and a brief statement of reasons therefor in the rules issued) that notice and public pro-

cedure thereon are impracticable, unnecessary, or contrary to the public interest.

(c) After notice required by this section, the agency shall give interested persons an opportunity to participate in the rule making through submission of written data, views, or arguments with or without opportunity for oral presentation. After consideration of the relevant matter presented, the agency shall incorporate in the rules adopted a concise general statement of their basis and purpose. When rules are required by statute to be made on the record after opportunity for an agency hearing, sections 556 and 557 of this title apply instead of this subsection.

(d) The required publication or service of a substantive rule shall be made not less than 30 days before its effective date, except—

(1) a substantive rule which grants or recognizes an exemption or relieves a restriction;

(2) interpretative rules and statements of policy; or

(3) as otherwise provided by the agency for good cause found and published with the rule.

(e) Each agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule.

§ 706. Scope of review.

To the extent necessary to decision and when presented, the reviewing court shall decide all relevant questions of law, interpret constitutional and statutory provisions, and determine the meaning or applicability of the terms of an agency action. The reviewing court shall—

(1) compel agency action unlawfully withheld or unreasonably delayed; and

(2) hold unlawful and set aside agency action, findings, and conclusions found to be—

(A) arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law;

(B) contrary to constitutional right, power, privilege, or immunity;

(C) in excess of statutory jurisdiction, authority, or limitations, or short of statutory right;

(D) without observance of procedure required by law;

(E) unsupported by substantial evidence in a case subject to sections 556 and 557 of this title or otherwise reviewed on the record of an agency hearing provided by statute; or

(F) unwarranted by the facts to the extent that the facts are subject to trial de novo by the reviewing court.

In making the foregoing determinations, the court shall review the whole record or those parts of it cited by a party, and due account shall be taken of the rule of prejudicial error.

2. Atomic Energy Act of 1954 § 189, 42 U.S.C. § 2239 (1970)

§ 2239.

Hearings and Judicial Review.—(a) In any proceeding under this chapter, for the granting, suspending, revoking, or amending of any license or construction permit, or application to transfer control, and in any proceeding for the issuance or modification of rules and regulations dealing with the activities of licensees, and in any proceeding for the payment of compensation, an award or royalties under sections 2183, 2187, 2236(c) or 2238 of this title, the Commission shall grant a hearing upon the request of any person whose

interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding. The Commission shall hold a hearing after thirty days' notice and publication once in the Federal Register, on each application under section 2133 or 2134(b) of this title for a construction permit for a facility, and on any application under section 2134(c) of this title for a construction permit for a testing facility. In cases where such a construction permit has been issued following the holding of such a hearing, the Commission may, in the absence of a request therefor by any person whose interest may be affected, issue an operating license or an amendment to a construction permit or an amendment to an operating license without a hearing, but upon thirty days' notice and publication once in the Federal Register of its intent to do so. The Commission may dispense with such thirty days' notice and publication with respect to any application for an amendment to a construction permit or an amendment to an operating license upon a determination by the Commission that the amendment involves no significant hazards consideration.

(b) Any final order entered in any proceeding of the kind specified in subsection (a) of this section shall be subject to judicial review in the manner prescribed in the Act of December 29, 1950, as amended, and to the provisions of section 10 of the Administrative Procedure Act, as amended.

3. National Environmental Policy Act of 1969 § 102, 42 U.S.C. § 4332 (1970 & Supp. V 1975)

§ 4332. Cooperation of Agencies; Reports; Availability of Information; Recommendations; International and National Coordination of Efforts.

The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public

laws of the United States shall be interpreted and administered in accordance with the policies set forth in this chapter, and (2) all agencies of the Federal Government shall—

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by subchapter II of this chapter, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of Title 5, and shall accompany the proposal through the existing agency review processes;

(D) Any detailed statement required under subparagraph (C) after January 1, 1970, for any major Federal action funded under a program of grants to States shall not be deemed to be legally insufficient solely by reason of having been prepared by a State agency or official, if:

(i) the State agency or official has statewide jurisdiction and has the responsibility for such action,

(ii) the responsible Federal official furnishes guidance and participates in such preparation,

(iii) the responsible Federal official independently evaluates such statement prior to its approval and adoption, and

(iv) after January 1, 1976, the responsible Federal official provides early notification to, and solicits the views of, any other State or any Federal land management entity of any action or any alternative thereto which may have significant impacts upon such State or affected Federal land management entity and, if there is any disagreement on such impacts, prepares a written assessment of such impacts and views for incorporation into such detailed statement.

The procedures in this subparagraph shall not relieve the Federal official of his responsibilities for the scope, objectivity, and content of the entire statement or of any other responsibility under this chapter; and further, this subparagraph does not affect the legal sufficiency of statements prepared by State agencies with less than statewide jurisdiction.

(E) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(F) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(G) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(H) initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(I) assist the Council on Environmental Quality established by subchapter II of this chapter.

4. 10 CFR § 51.20(e) (1977)

(e) In the Environmental Report required by paragraph (a) for light-water-cooled nuclear power reactors, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of

low level wastes and high level wastes related to uranium fuel cycle activities to the environmental costs of licensing the nuclear power reactor, shall be as set forth in the following table. No further discussion of such environmental effects shall be required. This paragraph does not apply to any applicant's environmental report submitted prior to June 6, 1974.

TABLE S-3. — *Summary of environmental considerations for uranium fuel cycle*

[Normalized to model LWR annual fuel requirement]

Natural resource use	Total	Maximum effect per annual fuel requirement of model 1,000 MWe LWR
Land (acres):		
Temporarily committed	63	
Undisturbed area	45	
Disturbed area	18	Equivalent to 90 MWe coal-fired powerplant.
Permanently committed	4.6	
Overburden moved (millions of MT)	2.7	Equivalent to 90 MWe coal-fired powerplant.
Water (millions of gallons):		
Discharged to air	156	≈2 percent model 1,000 MWe LWR with cooling tower.
Discharged to water bodies	11,040	
Discharged to ground	123	
Total	11,319	<4 percent of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousands of MW-hour)	317	<5 percent of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT)	115	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	92	<0.2 percent of model 1,000 MWe energy output.
Effluents—chemical (MT):		
Gases (including entrainment):[1]		
SO_x	4,400	Equivalent to emissions from 45 MWe coal-fired plant for a year.
NO_x[2]	1,177	
Hydrocarbons	13.5	
CO	28.7	
Particulates	1,156	
Other gases:		
F-	.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards—below level that has effects on human health.
Liquids:		
SO_4=	10.3	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constituents that require dilution and the flow of dilution water are: NH_3—600 cfs. NO_3—20 cfs. Fluoride—70 cfs.
NO_3-	25.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl^-	8.6	
Na^+	16.9	
NH_3	11.5	
Fe	.4	
Tailings solutions (thousands of MT)	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—Radiological (curies):		
Gases (including entrainment):		
Rn-222	75	Principally from mills—maximum annual dose rate <4 percent of average natural background within 5 mi of mill. Results in 0.06 man-rem per annual fuel requirement.
Ra-226	.02	
Th-230	.02	
Uranium	.032	
Tritium (thousand)	16.7	Principally from fuel reprocessing plants—Whole body dose is 6 man-rem per annual fuel requirements for population within 50 mi radius. This is <0.007 percent of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/yr has been included in fission products and transuranics total.
Kr-85 (thousands)	350	
I-129	.0024	
I-131	.024	
Fission products and transuranics	1.01	
Liquids:		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground—no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production-concentration 5 percent of 10 CFR 20 for total processing of 17.5 model LWR annual fuel requirements.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 percent of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Ru-106[3]	.15	From reprocessing plants—maximum concentration 4 percent of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR.
Tritium (thousands)	2.5	
Solids (buried):		
Other than high level	601	All except 1 Ci comes from mills—included in tailings returned to ground—no significant effluent to the environment, 1 Ci from conversion and fuel fabrication is buried.
Effluents — Thermal (billions of British Thermal Units)	3,360	<7 percent of model 1,000 MWe LWR.
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[1] Estimated effluents based upon combustion of equivalent coal for power generation.
[2] 1.3 percent from natural gas use and process.
[3] Cs-137 (0.075 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

Supreme Court, U. S.
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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,

Respondents.

No. 76-528

CONSUMERS POWER COMPANY,

Petitioner,

v.

NELSON AESCHLIMAN, *et al.*,

Respondents.

On Writs of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

BRIEF FOR THE NON-FEDERAL RESPONDENTS IN NO. 76-528

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In The

Supreme Court of the United States

October Term, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,

Respondents.

No. 76-528

CONSUMERS POWER COMPANY,

Petitioner,

v.

NELSON AESCHLIMAN, *et al.*,

Respondents.

On Writs of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

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BRIEF FOR THE NON-FEDERAL RESPONDENTS IN NO. 76-528

Introduction: A Point Of Clarification

We must begin by setting the record straight. Evidently recognizing that its position in *this* case[1] is weak, petitioner Consumers Power Company ("Consumers") tries to confuse matters by harping insistently on *another* case—the "fuel cycle" case, No. 76-419—and indulging in dire predictions of the death knell of nuclear power in the United States.

That is seriously inaccurate. It is true that the Court of Appeals decided the "fuel cycle" case on the same day as *Midland*, and that the two are consolidated here. But it is *not* true that the outcome of the "fuel cycle" case is necessarily dispositive in *Midland*. Although the Court of Appeals' 20-page decision in *Midland* (J.A. 89-111) notes in a single brief paragraph (J.A. 109) that its "fuel cycle" decision applies to *Midland* as well, the Court of Appeals reversed and remanded the *Midland* construction license grant on several *independent*, *non*-"fuel cycle" grounds.

Thus the "fuel cycle" case has only tangential significance here. To be sure, the "fuel cycle" ruling is important, and we believe it should be affirmed by this Court. If it is affirmed, then the decision remanding *Midland* to the Commission must likewise be affirmed. No one has questioned the correctness of the Court of Appeals' holding (J.A. 39 & n. 17) that only a *valid* "fuel cycle" rule could justify the Commission's adamant refusal to consider "fuel cycle" matters in *Midland*. But even if the "fuel cycle" ruling of the Court of Appeals is reversed, the *Midland* remand was based not only on the

[1] Hereafter referred to, consistently with the other briefs in these cases, as *Midland*. The Joint Appendix in this case and the "fuel cycle" case is cited herein: "J.A."

"fuel cycle" issue, but also on other entirely independent (and quite sufficient) grounds. Only if *all* of the Court of Appeals' holdings in *Midland* were wrong could reversal of that court's *Midland* remand be justified.

That also shows the complete inaccuracy of Consumers' claims that this case somehow signals the death knell of nuclear power. In the first place, neither the "fuel cycle" ruling nor the rulings in *Midland* have had any such effect. Even though both rulings have been in effect for more than a year, they have not prevented the Commission from continuing to license nuclear plants. In fact, the Court of Appeals' rulings have, to date, not even halted construction (in *Midland*) or operation (in *Vermont Yankee*) of the specific nuclear plants with which they dealt. As the Government points out, moreover (Br. at 37 n. 36), the Commission is actively engaged in developing a new "fuel cycle" rule; six months ago it promulgated an "interim" rule. 42 F.R. 13803 (Mar. 14, 1977). Thus no unseemly hiatus in licensing will result.

Consumers' "death knell" argument also seriously misstates what is at issue in this case. The fact is that this case, like many other administrative law cases, involves a particular individual record riddled with error as a result of the Commission's refusal to consider important safety and environmental issues. It is by no means an assault on the entire Commission licensing process, although Consumers attempts to make it so; in fact, this case is so unlikely to put a crimp in the nuclear licensing process that the Government originally opposed the grant of certiorari, and even now (Br. at 12) regards the issues in this case as "secondary." While the Court of Appeals' decision in *Midland* will undoubtedly assist in ensuring sound decision-making at the Commission level, then, not even the Government is prepared to give that decision the grandiose implications Consumers sees in it.

QUESTIONS PRESENTED

The questions presented in *Midland* (No. 76-528) are:

1. *Before* the Final Environmental Statement in *Midland* was prepared and environmental hearings held: (i) the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq.*, had for two years required consideration of alternatives which might partially obviate need for the proposed project, even if the agency involved has no direct power to implement them; (ii) the Commission itself had told Congress that energy conservation alternatives to building nuclear plants are legitimate issues under NEPA; and (iii) Intervenors had specifically challenged the failure of the draft Environmental Statement to consider (or even mention) energy conservation and demand-reducing alternatives. Nevertheless, the Commission refused to consider those alternatives, as "beyond our province." Did the Court of Appeals err in holding that the Commission's refusal violated NEPA?

2. The Advisory Committee on Reactor Safeguards (ACRS) is required by law to report publicly on the safety aspects of proposed nuclear plants before the plants can be licensed. After describing several safety-related reactor design problems, the ACRS' *Midland* Report commented, without explanation, that unspecified "other problems" existed and should be "resolved during construction," adding that the Midland plant could be operated without "undue risk" *if* "due consideration" were given to the unidentified "other problems." Did the Court of Appeals err in directing the Commission to obtain clarification of those statements, so that the safety issues could be fully considered?

3. Did the Court of Appeals err in directing the Commission, on remand, to "restrike the [NEPA] cost-benefit analysis, as necessary" and take into account in so doing (in addition to energy conservation alternatives) "waste disposal and other unaddressed fuel cycle issues" as well as materially changed circumstances undercutting the viability of the Midland nuclear project?

STATEMENT OF THE CASE

A. The Importance Of The Midland Public Hearings.

Before turning to the pertinent facts concerning the issues in this case, we must briefly correct Consumers' (and the Government's) claim that, because of its asserted length and thoroughness, the informal, pre-public hearing review of Consumers' license application by the Commission Staff, Consumers, and the ACRS is an important part of the factual background here. That claim is erroneous. In its proper context, including two major facts which Consumers and the Government omit, the *Midland* pre-hearing review—if it is relevant at all—simply emphasizes the importance of the public hearing required by statute.

First, by its very nature the *Midland* pre-hearing review was no substitute for the full and thorough public hearing mandated—even in uncontested cases, see 10 C.F.R. § 2.104(b)(2)—by 42 U.S.C. § 2239. The public did not, nor could it, participate in that review in any way. The participants in the review were Consumers, the Commission Staff, and the ACRS; public participation or even comment was neither sought nor entertained. Thus the public hearing was the only way to insure that the Commission would hear *all* points of view,

and take *all* of the relevant facts into account, in deciding whether or not to grant Consumers' application.

Second, in *Midland* as in most cases (see 10 C.F.R. § 2.104), the public hearing was not scheduled until after the Commission Staff, as a result of the informal pre-hearing review, had decided to support the license application. The *Midland* notice of hearing so stated. 35 F.R. 16750 (Oct. 29, 1970). The public hearing provided the only forum in which that tentative conclusion could be fully tested, questioned, and explored. Rather than downgrading the importance of insuring as full and balanced an analysis of the issues as possible during the public hearing, the pre-hearing review thus reinforced the need for that thoroughness, because (as one of the Commission's Appeal Boards recently conceded):

> "There is a natural reluctance upon the part of decision makers to depart from even tentative prior conclusions unless compelled to do so."

Potomac Electric Power Co. (Douglas Point Station Units 1 & 2), ALAB-277, 1 N.R.C. 539, 552 (1975).[2]

However long it lasted, then, the informal pre-hearing review in *Midland* did not make the statutory public hearing any less crucial. If anything, the pre-hearing review added to the importance of making certain that all relevant issues were thoroughly considered at the hearing.

[2] We might also note that at the time of the *Midland* pre-hearing review the Commission and its Staff were required by statute (42 U.S.C. §§ 2012, 2013) to perform the inherently conflicting jobs of both *promoting* the private peacetime uses of nuclear power, and *regulating* from a public interest and safety standpoint the very activity they were ordered to promote. In fact, it was that "basic conflict between the AEC's regulation of the nuclear power industry and its development and promotion of new technology for the industry" which led Congress to split those functions, by dividing the Commission into separate agencies, in the Energy Reorganization Act of 1974, 42 U.S.C. § 5801 *et seq.* See S. Rep. No. 93-980, U.S. Code Cong. & Adm. News, 93d Cong., 2d Sess. (1974) 5470, 5471.

B. The Commission's Foreclosure Of Issues During The Public Hearings In Midland.

1. The Commission's Refusal To Consider Energy Conservation.

Long before the May-June, 1972 *Midland* environmental hearings, President Nixon had emphatically written "energy conservation," including the need both to "conserve resources" and to "reduce wasteful consumption of energy," into national policy. See, *e.g.*, 117 Cong. Rec. 18049, 18052 (June 4, 1971); 118 Cong. Rec. 3140-42 (Feb. 8, 1972). See also 119 Cong. Rec. 13081, 13085 (April 18, 1973), reaffirming the importance of developing "means to limit future growth in energy demand" and urging "a national energy conservation ethic."

The Commission itself agreed. In August, 1971, its Chairman announced that the Commission intended "to be responsive to the concerns of conservation and environmental groups" in nuclear licensing; he added two months later that energy conservation was a "legitimate" and "not unreasonable" issue, and long before the *Midland* environmental hearings the Commission acknowledged that "the desirability and the means of limiting . . . [demand] growth are being debated today." *Effect of Calvert Cliffs And Other Court Decisions Upon Nuclear Power In The United States*, Report to Senate Comm. on Int. & Ins. Affairs, No. 92-28, 92d Cong., 2d Sess. (Comm. Print 1972) 24; *Selected Materials On The Calvert Cliffs Decision, Its Origin And Aftermath*, Joint Comm. on Atomic Energy, 92d Cong., 1st Sess. (Comm. Print 1972) 397; *Joint Hearings On The Operation Of The National Environmental Policy Act*, Senate Comms. on Pub. Works and Int. & Ins. Affairs, 92d Cong., 2d Sess. (1972) 202. In March, 1972—two months before the *Midland* environmental hearings

began—the Commission told Congress that AEC Licensing Boards had the "authority and responsibility" to consider every aspect of a NEPA cost-benefit analysis, including "the rationing or limiting the use of electricity as an alternative to building a particular nuclear power plant," and then-Chairman Schlesinger again stressed the need to "pay very careful attention" to energy efficiency, better insulating techniques, and other ways to reduce "the demand for electricity." *Hearings On The Calvert Cliffs Court Decision*, Part II, Senate Comm. on Int. & Ins. Affairs, 92d Cong., 1st Sess. (1971) 398, 406; *Joint Hearings*, *supra*, at 104. And the Commission agreed with the Council on Environmental Quality and the Environmental Protection Agency that NEPA required it to consider the alternative of not building a nuclear plant—*i.e.*, of using energy conservation measures to reduce an asserted need for power, rather than automatically assuming that the need must be met through more plant construction—in evaluating license applications. *Joint Hearings*, *supra*, at 405-09. Nor, all three agencies agreed, was consideration of that alternative to be limited to conservation measures the Commission itself could enforce. *Id.*, citing *Natural Resources Defense Council v. Morton*, 458 F.2d 827 (D.C. Cir. 1972).

The Commission also knew, long before the *Midland* environmental hearings, that it could not impose on Intervenors the burden of raising issues such as energy conservation. In December, 1971, some six months after the Court of Appeals' decision in *Calvert Cliffs' Coord. Comm., Inc. v. AEC*, 449 F.2d 1109 (D.C. Cir. 1971), the General Counsel of the Council on Environmental Quality wrote to several Federal agencies, including the Commission, to call their attention to certain of NEPA's requirements. Among them were the agency's obligation

to research environmental impacts on its own, and to take the initiative in considering environmental issues rather than waiting for others to raise the subject. *Hearings On The Calvert Cliffs Court Decision*, Part II, Senate Comm. on Int. & Ins. Affairs, 92d Cong., 1st Sess. (1971) 394-97. And *Calvert Cliffs* itself had made the point clear to the Commission in no uncertain terms (449 F.2d at 1119):

> "NEPA establishes environmental protection as an integral part of the Atomic Energy Commission's basic mandate. The primary responsibility for fulfilling that mandate lies with the Commission. Its responsibility is not simply to sit back, like an umpire, and resolve adversary contentions at the hearing stage. Rather, it must itself take the initiative of considering environmental values at every distinctive and comprehensive stage of the process beyond the Staff's evaluation and recommendation."

In addition, Intervenors had carefully and specifically raised energy conservation issues in their *Midland* Environmental Contentions, filed substantially before the Staff's Final Environmental Statement was prepared. For example, Intervenors sharply challenged the accuracy of the electrical demand projections on which the asserted need for the Midland Plant was based. Intervenors pointed out that the demand projections completely failed to consider:

> ". . . the possibility that rate structures will be revised so as to make large use of electricity on a per unit basis more expensive, thereby discouraging the increased use of electricity."

Contention 88, J.A. 1384; see also Contention 49, J.A. 1367-68. Contention 88 also noted that demand projections for major Consumers customers like General Motors were "inordinately high" in light of "the national movement to conserve energy." Intervenors attacked

Consumers' complete failure to analyze "the need to conserve energy resources" (Contention 85, J.A. 1383). Intervenors asserted that neither Consumers nor the Commission had even attempted to consider energy conservation measures (Contention 73, J.A. 1378-79):

> "A simple arithmetic extension of the present demand curve . . . makes it clear that in a very short period of time our economy will not be able to meet such a demand [for electricity]. There has been a failure to do any analysis as to means to create a *decrease* in demand for electricity or an elimination or curtailment of industrial and other uses of electricity which could be decreased or eliminated so the economy does not suffer in terms of goods and services."

And Intervenors directly and specifically challenged Consumers' failure to take existing energy conservation programs into account in asserting that there was a need for the Midland project (Contention 81, J.A. 1382):

> "Applicant's projection [of demand] assumes a continued growth and development of industry in the State of Michigan. Applicant has not adequately assessed the fact that there is a national and statewide conservation movement which may severely inhibit increases in industry. Applicant also has not considered the possibility that industry in Michigan will seek to expand elsewhere and, thus, not be available to support an alleged increase in demand."

Nevertheless, the Final Environmental Statement continued to ignore energy conservation, and both the Licensing Board (J.A. 207) and the Appeal Board (J.A. 306), at the specific urging of the Commission Staff (R. 16963), rejected Intervenors' energy conservation arguments as "beyond our province" and "beyond the pale of

what we view as required by NEPA."[3] In view of the Commission's later ruling professing an inability to comprehend Intervenors' contentions on the subject (J.A. 324-45), it must be stressed that *neither the Licensing Board nor the Appeal Board indicated the slightest doubt as to what Intervenors' contentions were, or the least bit of difficulty in understanding them.*

Now as in 1971, of course, energy conservation remains "the cornerstone of the National Energy Policy," *The National Energy Plan*, Executive Office of the President, Energy Policy and Planning (1977) 28, and the Commission has long since abandoned its view that "the subject of energy conservation must be altogether ruled out of licensing proceedings." *Niagara Mohawk Power Corp.* (Nine Mile Point, Unit No. 2), 6

[3] The Appeal Board claimed (J.A. 306) that "most" of Intervenors' Environmental Contentions "were in fact considered by the [Licensing] Board." But it did *not* include in its list of those contentions any reference to "a program to conserve electricity," even though it specifically (J.A. 305) identified such a program as among Intervenors' contentions. The Appeal Board also asserted that "the alternative of not building the plant at all is inherently part of the cost-benefit analysis which was carried out by the [Licensing] Board," J.A. 306. But the Licensing Board specifically *refused* to consider energy conservation possibilities in determining whether there was a need for the plant—and, *having thus decided not to question the need for the plant*, had little difficulty in concluding that the need could not be met without building the plant. Paragraphs 49 and 70 of the Licensing Board's decision (J.A. 208, 216) show the syllogism. The Board began by "accept[ing] the need and the 'benefit' of satisfying that need," so that—as the Board admitted—the outcome of the cost-benefit analysis was "practically a foregone conclusion." Having decided that, the Board went on to frame its discussion of alternatives in terms of the *assumptions* that a need for the plant existed and had to be satisfied by building a power plant: "*Assuming that the power needs are to be met*, are there better alternatives?" It was those very assumptions which Intervenors' energy conservation contentions sought to challenge—and into which, regardless of whether it "noted" Intervenors' contentions or "invited . . . brief[ing]" on them (Gov't Br. at 20 n. 18), the Board ultimately refused to permit inquiry.

A.E.C. 995 (1973). And just as Intervenors predicted (see, *e.g.*, J.A. 1382), energy conservation has called into serious question the need for the *Midland* project. See pages 18-19, below.

2. The ACRS Report And The Safety Issues.

The Advisory Committee on Reactor Safeguards (ACRS), which is required by statute to report to the Commission on the safety aspects of a license proposal (42 U.S.C. §§ 2039, 2232(b); 10 C.F.R. § 2.743(g)), played a major role in the pre-hearing review of Consumers' *Midland* application. As the Government tells us (Gov't Br. at 67), the ACRS is a vital source of "expert technical advice to supplement [the Commission's] own understanding and the work of [the] Staff." Its *Midland* Report was not only a mandatory part of the hearing record, 10 C.F.R. § 2.743(g), but also was used in preparing the Staff's Safety Evaluation (see R. 2515 at 81-82, 88-92), another basic part of the hearing documents relied upon by the Licensing Board. See, *e.g.*, J.A. 191-92, 197-98.

In fact, Licensing Boards must not only "review and become familiar with" the ACRS Report before the hearing begins, 10 C.F.R., Part 2, App. A, ¶ I(f) (1972), but "are instructed to rely on the ACRS review unless an ACRS item is contested." *Tennessee Valley Authority* (Hartsville Nuclear Plant), LBP-77-28, 5 N.R.C. 1081, 1119 (1977). And the ACRS Report has, according to the staff of the Joint Committee on Atomic Energy, an "important decisional influence on applications for reactors"—so much so that the Atomic Industrial Forum, an industry group, told the Joint Committee that "the advice of the ACRS . . . amounts to a determination that a license will or will not issue." *Improving the AEC Regulatory Process*, Joint Comm. on Atomic Energy (Comm. Print 1961), Vol. 1, 21-22, 48-49; *Views*

and Comments on Improving the AEC Regulatory Process, Joint Comm. on Atomic Energy (Comm. Print 1961) 7, 9. See also *Union of Concerned Scientists v. AEC*, 499 F.2d 1069, 1073 n. 5 (D.C. Cir. 1974).

At the time of the *Midland* hearings, however, ACRS meetings were shrouded in secrecy. Only the ACRS' conclusions, as embodied in its Report, were made public. In *Midland*, those conclusions were less than clear. After identifying several safety-related reactor design problems and suggesting appropriate design changes, the ACRS' *Midland* Report added (R. 2615-16):

> "*Other problems* related to large water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee believes that *resolution of these items should apply equally to the Midland Plant* Units 1 & 2.
>
> "The Committee believes that the above items can be *resolved during construction* and that, *if due consideration is given to these items*, the nuclear units proposed for the Midland Plant can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public." [Emphasis added.]

Nowhere did the Report identify the "other problems" or explain the italicized language.[4] Although Intervenors pointed out that the Report's obscurity meant that important safety and NEPA issues were left unexamined, unspecified, and unresolved, all of Intervenors' efforts to flesh out the "other problems" language were rejected. See J.A. 186 n. 2, 275-78.

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[4] The Government (Br. at 71-72) asserts that the ACRS later identified the "other problems." Even if that were correct, the Government admits that the supposed "identification" did not occur until *after* the Licensing Board's decision. Nor was the post-decision letter enough: even today, after yet a second such letter, the ACRS' Report remains unintelligible. See pp. 20-21, *infra*.

The Court of Appeals held (J.A. 107-08) that the *Midland* ACRS Report did not fulfill its statutory function of promoting a "full, free, and frank" public discussion of safety factors related to the Midland project. To the contrary, the opacity of the Report prevented Intervenors from fully exploring safety issues at the *Midland* hearings. Although the Court of Appeals hoped that the Report was at least intelligible to the Commission and the Staff (J.A. 107-08), the Staff has since admitted that the Report left it, as well as everyone else, in the dark. See pp. 20-21, *infra*.

3. The Dow Chemical Company Issue.

Everyone has known from the beginning that the involvement of Dow Chemical Company in the Midland project is not only crucial to the project's economic success but also its sole environmental *raison d'etre*. The Final Environmental Impact Statement (R. 17355 at XI-3), with which the Licensing Board agreed (J.A. 185, 206), is quite blunt:

> "If [Consumers] were not to supply process steam to the Dow Chemical Co., one unit of the Midland Nuclear Power Plant would be cancelled and consideration would be given to transferring the other unit to a different site, probably the existing Palisades site."

Consumers concedes, in fact, that the project would be "uneconomical" without Dow.

In early 1974, however, while this case was pending before the Court of Appeals, Consumers and Dow completely renegotiated their Midland contracts. Although the original contracts had required Dow to purchase *all* of its Midland electric and steam needs from the proposed nuclear plant, under the new contracts Dow is committed to purchase *no* electricity from the plant

other than as "auxiliary or standby" to Dow's own generating facilities. Similarly, under the renegotiated contracts Dow is obligated to purchase only 2,000,000 lbs./hr. of steam from the Midland Plant—less than half the amount on which the original cost-benefit analysis, both by the Licensing Board (J.A. 185, 206) and in the Final EIS, was based. Furthermore, although the Licensing Board (J.A. 206, 218) and the EIS (R. 17355 at XI-10) regarded the closing of Dow's fossil-fuel facilities as a "major benefit" from the Midland project, under the renegotiated contracts Dow is not required to close down those facilities. See R. 24350, 25718, 25731.

Intervenors called those developments to the Commission's attention, asking that the record be reopened to consider whether the new developments (coupled with the fact that the estimated costs of the Midland plant had more than tripled since the cost-benefit analysis had originally been performed) required complete restriking of the cost-benefit analysis. The Commission twice summarily refused to reopen the case. J.A. 346-47, 348-49. After Intervenors pointed out to the Court of Appeals that the Commission had acted without even looking at the new contracts, the Commission—*sua sponte*, without notice, and assertedly because Dow had taken the "unusual step" of withdrawing from the case—did reopen the case, to the extent of obtaining and reviewing the contracts. It declined to take further action, however (J.A. 350-51), on the curious ground (p. 45 of its Brief in the Court of Appeals) that "the closing of Dow's plant was not a determinative factor in its cost-benefit analysis."

After holding that *Midland* must be remanded to the Commission for consideration of the energy conservation and ACRS issues discussed above and for "appropriate consideration of waste disposal and other unaddressed fuel cycle issues" (see J.A. 109), the Court of Appeals

told the Commission to consider the drastic changes in the Consumers-Dow relationship as well (J.A. 109):

> "As this matter requires remand and reopening of the issues of energy conservation alternatives as well as recalculation of costs and benefits, we assume that the Commission will take into account the changed circumstances regarding Dow's need for process steam, and the intended continued operation of Dow's fossil-fuel generating facilities."

During the Commission hearings conducted after the Court of Appeals' remand, substantial evidence concerning the Dow-Consumers relationship has been heard. Once again, it has shown that Intervenors', and the Court of Appeals', concerns were amply justified. See pp. 22-24, *infra*.

4. The "Fuel Cycle" Issues, As They Pertain To Midland.

The facts pertaining to the Commission's "fuel cycle" rulemaking (the subject of No. 76-419) have only a tangential bearing on *Midland*, as explained at pp. 2-3, *supra*. Because of that and because those facts are fully discussed in the Brief (which we adopt) of respondent Natural Resources Defense Council in No. 76-419, we do not detail those facts here.

That is not to say, however, that the nuclear fuel cycle itself is unimportant in *Midland*. In both economic and environmental terms, the significance of the fuel cycle in *Midland* is apparent from the large amounts of waste the plant will produce. *Each year*, the Midland plant will spew forth 4,200 cubic feet of solid radioactive waste (12 to 15 truckloads, or 3 to 5 rail carloads), 20,000 gallons of liquid waste (6 truckloads, or 3 rail carloads), and waste fuel at the rate of 60 fuel elements —each element containing "large amounts [we are not told how much] of fission products and some plutonium." Final Environmental Statement (R. 17355) at III-42, 43. Those figures should be multiplied by 34 years (the estimated useful life of the plant) to determine Midland's overall contribution to the nuclear waste problem.

Despite their importance, "fuel cycle" issues have never been considered in *Midland*. Although Intervenors directly raised those issues, including those dealt with by the "fuel cycle" rule involved in No. 76-419, as part of their Environmental Contentions in *Midland* (see Contentions 17-27, J.A. 1348-55), both the Licensing Board and the Appeal Board rejected them out of hand on the somewhat contradictory grounds that: (a) the issues were "remote and speculative" since (as the Final EIS admits, R. 17355 at III-42, 43) no one knows what to do about nuclear waste disposal, and (b) nevertheless, the Commission was dealing with those very issues in the then-pending rulemaking (not completed until over a year later). J.A. 173-83, 205-06, 311.

C. The Hearings Before The Commission Following The Court Of Appeals' Remand.

Although both Consumers and the Government acknowledge that the Commission has been far from idle following the Court of Appeals' *Midland* decision, neither explains what has happened before the Commission. An explanation is essential, however, because the post-remand hearings have emphasized the correctness of the Court of Appeals' *Midland* decision as to every point at issue in this Court. Quite simply, if the Commission had permitted exploration of the issues during the original *Midland* hearings, this case might be unnecessary; far from procedural nitpicking, the court's ruling dealt with issues the facts have shown to be vital to the Midland project.

Following the Court of Appeals' decision, the Commission reconvened a Licensing Board for the purpose of considering whether the *Midland* construction permits should be suspended pending full consideration of the issues remanded by the Court of Appeals.[5] Hearings on the suspension issue began last November, and ended in mid-May 1977, having in the interim yielded considerable information concerning the energy conservation, ACRS, and Dow Chemical Company issues remanded by the Court of Appeals. Because the facts elicited during the 1976-77 hearings[6] strongly support the Court of Appeals' rulings on those issues, we shall briefly summarize the facts here.

1. The Energy Conservation Issue.

Even before the suspension hearings were held, Consumers had admitted to the Commission that, just as Intervenors had predicted (see J.A. 1382), the demand projections on which the Commission had relied in *Midland* were seriously exaggerated "*because of energy conservation;*" in consequence, Consumers dropped entirely plans

[5] At first, the Commission limited the suspension hearings to the "fuel cycle" issue. *General Statement of Policy*, 41 F.R. 34707, 34709 (Aug. 16, 1976). Three months later it reversed itself, ordering the suspension hearings to take into account all issues remanded by the Court of Appeals *except* the "fuel cycle" issue (concerning which it anticipated promulgating an "interim" rule). *Consumers Power Co.* (Midland Plant, Units 1 & 2), CLI-76-19, NRCI-76/11, 474 (1976). After the interim rule was announced, 42 F.R. 13803 (Mar. 14, 1977), the Commission added the "fuel cycle" issue to the others, subject, however, to the terms of the interim rule. *Consumers Power Co.* (Midland Plant, Units 1 & 2), ALAB-396, 5 N.R.C. 1141 (1977).

[6] For convenience, reference to the record in the suspension hearings will be in the form "1977 Hrgs.," followed by the transcript or exhibit reference.

to construct another nuclear plant.[7] Consumers' testimony during the *Midland* suspension hearings has further established that large components of Consumers' demand—for example, residential space heating demand—actually *declined* during 1974 and 1975, as Intervenors predicted might occur if rates went up (Environmental Contention No. 88, J.A. 1384), and has proved that most of Intervenors' other energy conservation contentions were correct. Just as Intervenors suggested (Environmental Contention No. 81, J.A. 1382), for example, both industrial and population growth in Michigan are now expected to remain at a standstill for the foreseeable future. And, again just as Intervenors suggested (Environmental Contention No. 89, J.A. 1384), it appears that Consumers' failure to consider energy conservation has resulted in serious overestimates of electricity sales to General Motors, a major component of Consumers' industrial load. 1977 Hrgs., Tr. 1896-97, 1979, 1981, 1983-84, 2000-01, 2004, 2006, 3322-23; Midland Intervenors' Exhibits 22, 36. In fact, just as this Brief was completed, Consumers revised its demand projections downward yet again—including a drop of 38.5% in its projected demand for 1979.[8]

[7] *Consumers Power Co.*, (Quanicassee Units 1 & 2), Dkts. 50-475, 50-476, Applicant's Petition to Withdraw Notice of Hearing (May 9, 1974) 2-5. The full text of the Petition is Exhibit A to Intervenors' Reply Brief in the Court of Appeals. See Intervenors' Environmental Contention No. 77 (J.A. 1380), pointing out that even before the initial *Midland* environmental hearings, Consumers had dropped plans to construct a different plant for similar reasons.

[8] By order dated September 23, 1977, the reconvened Licensing Board declined to suspend the *Midland* construction permits. It recognized that "there are substantial equities favoring . . . suspension", admitted that Intervenors had demonstrated "the weakness of the original NEPA review and the weakness of the original ACRS letter," and conceded that

(Footnote continued on following page)

2. The ACRS Issue.

As soon as the suspension hearings began to give the ACRS issue the kind of scrutiny Intervenors sought, but the Commission refused, during the original hearings, it became apparent that the opacity of the ACRS *Midland* Report was worse even than the Court of Appeals had thought. Although the court had hoped that the Report at least gave the Commission (if no one else) the "benefit of ACRS members' technical expertise" (J.A. 108), Staff testimony quickly established that the Report was as unenlightening to the Staff as it was to Intervenors. The Staff witness who testified on the subject at the 1977 hearings frankly admitted that he had no idea whether the ACRS' "other problems" should—or even *can*—be "resolved during construction;" to the contrary, he speculated that "the plant in fact could go through its entire lifetime with some of these items still being held in a resolution pending category." 1977 Hrgs. Tr. 4220. Nor had the Staff witness any idea of what the ACRS

[8] *continued*
continued construction would increasingly foreclose alternatives to the project and render a fair cost-benefit analysis more difficult. Nevertheless, the Board held that it was powerless to act, because of the amounts Consumers has already spent. (The Board was uncertain enough of its lack of power, however, to *sua sponte* refer its ruling to the Appeal Board.) By considering Consumers' "sunk costs," what the Board has done is to reward Consumers' stalling (and the Commission's refusal to follow NEPA the first time around). Using Consumers' post-construction permit expenditures to justify still further expenditures, despite the impropriety of the original construction permit grant (and despite the Board's finding that Consumers had attempted to conceal vital information, see pp. 23-24, *infra*), means that anyone who can delay NEPA compliance for long enough will thereby be excused from complying with NEPA at all. It means that an illegal course of conduct, if sufficiently persistent, becomes unredressable and unreviewable. That is not the law. See J.A. 109-10 n. 20; *Union of Concerned Scientists v. AEC*, 499 F.2d 1069, 1084 n. 37 (D.C. Cir. 1974).

meant by its admonition (on compliance with which its finding of safety was predicated) that "due consideration" must be given to the "other problems." After offering a guess that only a good-faith stab at the problems was required, he again confessed ignorance: "I do not know the standards that the ACRS applies to it, no." 1977 Hrgs., Tr. 4219. And even though he conceded that solving (or trying to solve) the "other problems" could be so expensive as to have a significant impact on the ultimate NEPA cost-benefit analysis for the Midland project, the Staff witness testified that he had no idea what the overall cost might be. 1977 Hrgs., Tr. 4259-61, 4265-66. These admissions of ignorance, it may be noted, were made even though the Staff had the benefit of a supplemental ACRS Report, purportedly prepared to comply with the Court of Appeals' ruling.[9]

In short, the *Midland* ACRS Report has left even the Commission Staff in the dark as to what the ACRS' "other problems" are, whether they *must* be resolved in order to assure safety, whether they *can* be resolved, *how* they should be resolved, and *how much* "resolution" (or "due consideration," whatever that means) will cost. Thus both safety and NEPA issues continue to hang fire, awaiting some explanation of what the ACRS has in mind.

[9] On November 18, 1976, the ACRS responded to a request of the reconvened Licensing Board for a supplemental Report. The Staff testimony quoted in the text was given several months later. Although the Licensing Board specifically found the supplemental Report unclear and unsatisfactory and so advised the ACRS (with a request for further information), by letter of March 16, 1977 the ACRS refused to respond further. The Board has not yet decided what action to take concerning the ACRS' recalcitrance. (This, of course, shows that the Government's reliance, Br. at 71, on the ACRS' much earlier additional letter is misplaced. The Staff's ignorance was not clarified by that letter, any more than by the supplemental Report.)

3. The Dow Chemical Company Issue.

During the suspension hearings, both the President of Dow Chemical U.S.A. and the General Manager of its Michigan Division (responsible, until his recent promotion to membership on the operating board of Dow U.S.A., for matters involving Consumers) testified at length concerning the deteriorating Dow-Consumers relationship. That deterioration, which was the chief cause of the drastic 1974 revision in the Dow-Consumers contracts which Intervenors previously called to the Commission's attention, has worsened steadily. Both the President of Dow U.S.A. and the General Manager of its Michigan Division testified, during the suspension hearings, that: (i) the economic advantages of the Midland project to Dow have become marginal, if not nonexistent; (ii) Dow has no confidence at all in Consumers' management ability, ability to finance completion of the Midland project, cost estimates for the project, or estimated schedule for the project; (iii) *if Dow were today given the option of entering into the same contract with Consumers, Dow would refuse to do so;* and (iv) Dow is actively considering as a "realistic option" complete withdrawal from the Midland project, and suit against Consumers, on the ground of breaches of contract by Consumers. Both men also testified that Dow's *pro forma* support for the Midland project is at best reluctant (and heavily influenced by Consumers' threats of multi-million dollar litigation, which Dow's house counsel termed "pretty damn close to blackmail"), and could vanish entirely in the event of "any significant change that might take place from the current conditions—that could include almost anything." 1977 Hrgs., Tr. 323, 405-09, 2288-91, 2297-2301, 2311-12, 2322, 2432, 2505-07, 2516, 2522-24, 2690, 2699, 2707-12, 2723-24, 2730; Midland Intervenors' Exhibit 25.

Of extreme importance, in view of the extent to which the regulatory process depends on the candor of utilities like Consumers, is the revelation (and Board finding) that Consumers and its counsel attempted "cover-up" tactics at the suspension hearings. According to notes of meetings with Consumers produced by Dow at the suspension hearings, Consumers told Dow before the hearings that it wished to "finesse [the] Dow-Consumers continuing dispute" by having Dow tender a witness unaware of the facts. 1977 Hrgs., Tr. 2399-2400, 2703; Midland Intervenors' Exhibit 25. When Dow refused, Consumers undertook to draft the written testimony of the Dow witness, Mr. Temple. 1977 Hrgs., Midland Intervenors' Exhibit 60A, items A1, B; Tr. 2379-80. On cross-examination, Mr. Temple agreed that the written testimony was "not open, not honest, and not consisting of all the relevant information." 1977 Hrgs., Tr. 2307, 2379-82[10]

In its recent Order on the suspension issues (see p. 19, n. 8, *supra*), the Licensing Board concluded that whether Dow will ever buy steam from the Midland plant "is, on the record, *speculative*," and if Dow does not buy steam from the Midland plant "the circumstance will be one of a plant at a site for which only very limited alternatives were explored, designed in substantial part for a purpose which will not be ful-

[10] Although Consumers says that this Court need not concern itself with the Dow issue because the Commission has authority to consider the issue regardless of this Court's ruling (Br. at 17, 47), Consumers has taken a directly contrary approach before the Commission. Before the Commission, Consumers has repeatedly argued that the Commission can consider only the precise issues remanded by the Court of Appeals, and even as to those issues can consider only the particular point or points specified by the Court of Appeals. In particular, Consumers told the Commission, in its June 13, 1977 Brief on the suspension issue, that the Commission is powerless to look beyond the bare fact that contracts between Dow and Consumers exist.

filled." The Board also concluded that, although the attempt of Consumers and its counsel to suppress information concerning the Dow dispute apparently failed (because of Intervenors' "aggressive" participation[11]), "there remains the suspicion, raised by the disclosure of these instances [of concealment], that there may have been similar ploys which were successful."

4. The "Fuel Cycle" Issues, As they Pertain To Midland.

As the Court of Appeals explained in its "fuel cycle" opinion (J.A. 39-40 n. 17), the "fuel cycle" ruling affects *Midland* primarily because the exclusion of all "fuel cycle" matters from license proceedings—including *Midland*—was invalid given the invalidity of the rule on which that exclusion was based. Pending promulgation of a new and valid rule, then, "fuel cycle" matters must be dealt with in individual license proceedings. Accordingly, in its *Midland* opinion the court ordered that "fuel cycle" issues be given "appropriate consideration" on remand. J.A. 109.

That has not yet been done. Although initially leaving "fuel cycle" issues open for consideration in the suspension hearings, shortly after the hearings began the Commission removed those issues from the hearing in anticipation of a new "interim" rule. By the time the rule was promulgated and the issues once again opened for consideration, the suspension hearings were virtually over; the "fuel cycle" issues have not yet been dealt with. See p. 18, n. 5, *supra*.

But the "fuel cycle" aspect of *Midland* remains significant, in economic as well as environmental terms. The cost of nuclear fuel for the Midland plant is an important component of its overall economic feasibility, as Dow's Mr. Temple testified at the suspension hearings (1977 Hrgs., Tr. 2419-22), and one which has been consistently escalating. Even during the post-remand period, Consumers has raised its nuclear fuel cost estimates more than once (see 1977 Hrgs., Tr. 3781-85), and the Commission Staff has asserted (in its Proposed Findings on the suspension issue) that "[i]t is uncertain whether Dow would again conclude that the Midland Plant is economically preferred if the revised nuclear fuel cost data were used."

[11] And *not*, we note, because of any information uncovered by the Staff in the pre-hearing discussions so heavily relied on by Consumers and the Government. See pp. 5-6, *supra*.

In addition, although the availability of plutonium recycling was assumed in the original Midland hearings (and in both the new "interim" fuel cycle rule and its invalid predecessor), the Administration has now officially opposed recycling. As Consumers has recognized, that will further escalate the net cost of nuclear fuel. In testimony submitted by Consumers to the Michigan Public Service Commission in a still-pending rate proceeding, Consumers has taken the view that in computing nuclear fuel costs the "salvage" value of the fuel—*i.e.*, its post-use value in the event that reprocessing takes place—must now be assumed to be zero.[12]

It will be observed that in each instance the facts, as they have developed, tend to bear out both the claims made by Intervenors as to the issues foreclosed by the Commission and the importance of those issues to the ultimate decision about the Midland project.

[12] Michigan Public Service Commission Dkts. Nos. U-4840, U-4621, prepared testimony of Ronald L. Hikes (Jan. 6, 1977).

SUMMARY OF ARGUMENT

While *Midland* is by no means the arena in which the future of nuclear power will be decided, the issues it presents are extremely important in the context of the Midland project itself. They are linked by a common thread: in each instance, the Commission refused to consider or explore issues it is mandated by statute to address before licensing nuclear plants, and in each instance the Commission's refusal to explore the issues has seriously impaired the accuracy of its ultimate conclusions. In fact, in each instance the Commission has in one way or another subsequently admitted that it was wrong.

I

As to the energy conservation issues which were barred by the Commission, for example, the Commission itself has long since admitted that NEPA requires exactly what it refused to do in *Midland*—and requires it, moreover, to do so completely without regard to whether Intervenors raise the issue. The Commission's excuses for not doing in *Midland* what it admits it must do in every other case are lame at best. Its claim that energy conservation was a subject so novel when *Midland* was heard as to require Intervenors directly to present it (and in fact to prove that each of their suggestions would obviate the need for the Midland project, as a prerequisite to the Commission's consideration of them) is factually false as well as directly contrary to the fundamental thrust of NEPA. Long before the environmental hearings in *Midland*, energy conservation was a crucial part of national energy policy, and the Commission itself had advised Congress that it was well aware of that fact and of its duty to consider energy conservation in licensing nuclear plants.

In fact, the Commission's "hindsight" argument is no more than an avoidance by afterthought. Neither the Licensing Board nor the Appeal Board, which rejected Intervenors' energy conservation contentions as "beyond our province," claimed inability to understand the contentions or unfamiliarity with their basic subject matter. The "threshold test" imposed by the Commission did not surface until more than a year later, as a *post hoc* rationalization for the Commission's refusal to direct the Boards to do what they should have done in the first place. The Government's accusation that the Court of Appeals imposed "hindsight" on the Commission, then, is both inaccurate and spurious. The Court of Appeals told the Commission nothing that the Commission did not already know.

Equally spurious is the claim that Intervenors did not adequately raise energy conservation issues. To begin with, they were not required to raise those issues at all as a prerequisite to Commission consideration; NEPA imposes the obligation to "consider and give effect to" environmental factors "to the fullest extent possible" *on the Commission*, not on Intervenors. That also is no surprise to the Commission, which had announced its acceptance of that principle more than a year before the *Midland* environmental hearings. Furthermore, Intervenors did raise energy conservation issues in a manner sufficient forcefully to apprise the Commission of their presence in the case and their potential significance. The Commission's contrary argument is inaccurate insofar as it claims that Intervenors did not do enough, and in flat derogation of NEPA insofar as it claims that Intervenors should have done more. Especially in light of the Government's own emphasis on the length and scope of the Commission's pre-hearing

study of the Midland project, it is ridiculous to claim that the Commission was unable to unearth and consider the necessary energy conservation information unless Intervenors led it by the hand.

Nor is energy conservation a peripheral issue in *Midland*. The Commission admits that energy conservation, by virtue of NEPA, is not a peripheral issue in *any* case, and that is underscored by the primacy of energy conservation, both in 1971 and today, as the "cornerstone" of national energy policy. In *Midland*, moreover, events have proved the accuracy of nearly all of Intervenors' energy conservation contentions. Far from supporting the Government's attempt to brush off the subject as unimportant, that reinforces the conclusion—obvious from NEPA and the Commission's own admission—that the Commission should have done initially precisely what it is now doing, under the prodding of the Court of Appeals' decision.

II

The same is true of the ACRS Report. The Commission Staff has now admitted not only that it finds the Report incomprehensible (a point supported by a recent Licensing Board decision in another case), but also that unveiling the Report's obscurities is essential for purposes of the NEPA cost-benefit analysis in *Midland*, as well as in order to conduct the "full, free, and frank" discussion of safety hazards mandated by Congress. And it has been clear from the beginning that the vagueness of the ACRS Report prevented exploration of safety issues at the *Midland* hearings, even though that exploration is one of the principal purposes of the hearings.

In light of the Staff's admissions, it will not do to claim that the ACRS Report does not matter, or that it is a side issue. Even without those admissions, the ACRS Report is clearly not the mere public relations gimmick

the Commission branded it in attempting to foreclose safety issues from consideration. Thus the problem is not whether the Report fell short of its purpose; clearly it did. The problem is how best to remedy the defect. The Court of Appeals adopted the least possible remedy, one which the Government admits the Commission has itself employed on other occasions. While the Court could and should have done more, there can be no quarrel with the propriety of the remedy it chose.

III

Finally, the propriety of the Court of Appeals' remand of the Dow and "fuel cycle" issues cannot seriously be doubted. As to the Dow issue, the Commission itself admitted the importance of the changes in the Dow-Consumers relationship (and the error of its earlier refusal to consider the changes at all) by reopening the record and reviewing the new Dow-Consumers contracts. Nothing in this Court's decisions, let alone in NEPA's requirement—acknowledged by the Commission—that reassessment of costs and benefits be conducted in light of changing facts, justifies the Commission's refusal to go further, particularly inasmuch as the basis for that refusal (its claim that the Dow relationship was unimportant) is directly contradicted by both the Environmental Impact Statement and the Licensing Board's decision.

Whatever might be the case if the Dow issue were the only reason for requiring the Commission to restrike its cost-benefit balance, since the Commission's other errors required such a restriking in any event it would be sheer stultification to exclude the changed Dow facts from that reassessment. And the same is true of the fuel cycle issue. Whether or not that issue will in the end be determinative of the Midland project's economic or environmental propriety is not the point (though the importance of the issue should not be minimized, in light of

the peculiar facts of *Midland*). The point is that the issue has never been examined in *Midland*, so that we have no way of knowing how important it is. A valid rule might offer an adequate means of factoring fuel cycle issues into individual cases without the need for case-by-case analysis. But an *invalid* rule—as the Court of Appeals determined the "fuel cycle" rule to be—obviously cannot. No one quarrels with the Court of Appeals' conclusion that until a valid rule is adopted, "appropriate consideration" must be given to fuel cycle issues on a case-by-case basis. That has not yet been done in *Midland;* in fact, although the pending rulemaking was the basis for the Commission's refusal to consider fuel cycle issues in *Midland*, not even the rule itself was considered in *Midland*. It was not adopted until more than a year after the *Midland* record was closed.

Overall, then, the consequence of the Commission's foreclosure of issues in *Midland* was a decision which neither took the required "hard look" at the relevant issues nor rested on "a consideration of the relevant factors." The Court of Appeals quite properly told the Commission to reexamine that decision.

ARGUMENT

As is obvious from the facts and as the Government (Br. at 12) tacitly concedes by branding them "secondary," the issues in *Midland* involve neither the future of nuclear power nor any threat to the Commission's licensing activities. They involve only the Commission's refusal, in defiance of specific statutory commands, to consider specific safety and environmental issues in the

context of a particular license proceeding. That the Commission's actions were narrow, as well as unjustifiable, appears from the fact that it has either expressly or implicitly admitted error in each instance. See pp. 32-33, 39, 49, 56, *infra*.

While the issues dealt with by the Court of Appeals in *Midland* do not have the cosmic implications ascribed to them by Consumers, however, they are of unmistakable importance in terms of the Midland project itself, and the Commission's actions run squarely counter to fundamental principles of administrative law. By throttling at its inception the development of an adequate record on these issues, the Commission not only prevented the full and fair public hearing to which Intervenors were entitled and which Congress commanded even in uncontested cases, but threatened to subvert the informed judicial review without which ". . . *expertise*, the strength of modern government, can become a monster which rules with no practical limits on its discretion." *Burlington Truck Lines v. United States*, 371 U.S. 156, 167 (1962). Particularly in light of the facts which have come to light now that the Commission *has* begun to deal with the issues, this case emphasizes the wisdom of this Court's comment in *Silver v. New York Stock Exchange*, 373 U.S. 341, 366 (1963):

> "Experience teaches . . . that the affording of procedural safeguards, which by their nature serve to illuminate the underlying facts, in itself often operates to prevent erroneous decisions on the merits from occurring."

That is the focus of the discussion which follows. It is unremarkable, perhaps; the books are full of decisions like that of the Court of Appeals, holding that agencies cannot arbitrarily bar or truncate inquiry into relevant

subjects. Rhetoric aside, the Court of Appeals' decision simply applied those settled principles. Certainly it does not remotely signal the "death knell" of nuclear power. To the contrary, by fostering the "full, free, and frank" public hearings mandated by Congress, the Court of Appeals has if anything aided the nuclear cause. Public acceptance of nuclear plants is far more likely to occur when the public knows that the issues have genuinely been explored than when—as here—the hearings result in a series of important but completely unexamined questions.

I.

THE COURT OF APPEALS CORRECTLY HELD—AS THE COMMISSION HAS SINCE ADMITTED—THAT THE COMMISSION'S REFUSAL TO CONSIDER ENERGY CONSERVATION ISSUES WAS IMPROPER.

Consumers and the Government cannot, of course, defend on the merits the Commission's refusal to consider energy conservation alternatives in *Midland*. Well before the Licensing Board's decision, the President had written energy conservation into national policy, and the Commission itself had agreed that energy conservation was among the proper subjects of its NEPA inquiry. It knew, moreover, that its duty to consider energy conservation did not depend on whether Intervenors raised the issue, *Calvert Cliffs' Coord. Comm., Inc. v. AEC*, 449 F.2d 1109, 1119 (D.C. Cir. 1971), nor upon whether it had any direct power to implement conservation measures. *Natural Resources Defense Council v. Morton*, 458 F.2d 827, 836 (D.C. Cir. 1973); see pp. 8-9, *supra*. Not long after *Midland*, in fact, the Commission abandoned its attempt to bar conservation "at the threshold." *Niagara Mohawk Power Corp.* (Nine Mile Point, Unit 2), 6 A.E.C. 995 (1973). Well before *Niagara Mohawk*, the

Federal Power Commission had reached the same conclusion, 38 F.R. 15944, 15949 (June 18, 1973); as early as three months before the *Midland* Licensing Board decision, the FPC had affirmatively emphasized the importance of energy conservation measures in power licensing, and specifically stressed many of the same points Intervenors made in their energy conservation contentions. 37 F.R. 20045-46 (Sept. 23, 1972).

In the face of all that, Consumers and the Government wisely do not try to defend the undefendable. Instead, they engage in confession and avoidance. While they recognize that the Commission is obligated not only to consider energy conservation, but to do so on its own initiative regardless of whether Intervenors raise the subject, see J.A. 344, Consumers and the Government try to excuse the Commission's refusal to do so here on two fictitious grounds. The first is the claim that energy conservation is such a new subject as to have been outside NEPA's purview when *Midland* was decided; allied to that is the claim that the Commission was justified in applying its tardy *Niagara Mohawk* recognition of its NEPA obligations prospectively only. The second is the claim that Intervenors did not adequately raise energy conservation contentions.

A. The "Hindsight" Argument Is Wholly Spurious And Factually False.

To begin with, the "hindsight" argument is the worst sort of "*post hoc* rationalization," and should not be taken seriously at all. *Burlington Truck Lines v. United States*, 371 U.S. 156, 168-69 (1962); *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 419 (1971). At no time did the Licensing Board or the Appeal Board assert that energy conservation was a novel subject the parameters of which they did not understand. They did not even

claim that energy conservation was unimportant. They simply said that it was, *as a matter of law, not a proper contention* under NEPA: "beyond our province" in the words of the Licensing Board, and "beyond the pale of what we view as required by NEPA" in the words of the Appeal Board. J.A. 207, 306. The "hindsight" argument, in fact, did not surface until the Commission's attempt, more than a year after the Licensing Board's decision, to defend its refusal to reopen the environmental record, in the teeth of *Niagara Mohawk*, on the ground that energy conservation was "a novel and evolving concept." J.A. 344. Especially in light of its factual inaccuracy, discussed below, the "hindsight" argument is manifestly an excuse, not a reason, and one which limps lamely after the fact.[13]

More important, however, is the fact that the "hindsight" claim is simply wrong. We showed at pages 7-9, *supra*, that long before the Licensing Board's decision, the Commission itself had advised Congress that energy conservation was not only comprehensible but an eminently proper subject of inquiry in licensing proceedings, and that President Nixon had repeatedly stressed the importance of energy conservation as a matter of national policy. Also before the Licensing

[13] The "hindsight" argument also contradicts the Commission's claim (J.A. 341) that Intervenors' energy conservation contentions were in fact considered by the Licensing Board. Although that claim is completely erroneous (see page 11 n. 3, *supra*) and was quite correctly rejected by the Court of Appeals after thorough review of the record (J.A. 95, 103), that it was made at all underscores the fact that energy conservation was far from the arcane mystery Consumers and the Government now depict. One can hardly consider on the merits a concept one cannot comprehend. Even though quite mistaken, then, the claim that the Licensing Board did consider energy conservation on the merits shows both that the Board knew perfectly well what energy conservation means and that Intervenors had adequately called the Board's attention to that subject.

Board's *Midland* decision, a report to the Senate Committee responsible for NEPA had reached the same conclusion:

> "Probably the most extreme alternative to be considered [under NEPA] for [nuclear] power plants is that demand for electricity be curbed rather than build additional capacity."

Effect of Calvert Cliffs And Other Court Decisions Upon Nuclear Power in the United States, Report to Senate Comm. on Int. & Ins. Affairs, No. 92-28, 92nd Cong., 2nd Sess. (1972) 51. And we have already pointed out that the FPC found energy conservation perfectly understandable, and a required part of its own NEPA analyses, long before the Commission's "novel and evolving concept" claim professed its inability to cope with the subject. Indeed, case law had also emphasized the matter well in advance of the Licensing Board's decision; see *Natural Resources Defense Council v. Morton*, 458 F.2d 827, 836 (D.C. Cir. 1972), which the Commission had promised faithfully to follow in statements to Congress before the *Midland* environmental hearings even began. *Joint Hearings*, *supra* p. 7, at 409.

Thus, the "hindsight" argument is a complete sham. It is also directly contrary to the fundamental purpose of NEPA. The object of NEPA was to *avoid* lurching from crisis to crisis, belatedly waking up to fuel shortages and destroyed resources only after the crunch has become unavoidable:

> "The agency need not foresee the unforeseeable, but by the same token neither can it avoid drafting an impact statement simply because describing the environmental effects and alternatives to particular agency action involves some degree of forecasting. . . . It must be remembered that the basic thrust of an agency's responsibilities under NEPA is to predict the environmental effects of proposed action before the action is taken and those effects fully known."

Scientists' Institute for Public Information v. AEC, 481 F.2d 1079, 1097 (D.C. Cir. 1973). In light of the President's repeated emphasis on energy conservation as a matter of national policy and the affirmative NEPA requirement that *all* alternatives to environmental damage be considered "to the fullest extent possible" *before* an "irreversible and irretrievable commitment of resources" has been made, 42 U.S.C. § 4332, it is impossible to take seriously the claim that energy conservation alternatives were "beyond the pale of . . . NEPA" when *Midland* was decided.

B. The Commission Had No Right To Apply Niagara Mohawk "Prospectively Only".

What we have just seen also disposes of the claim that the Commission was entitled to apply *Niagara Mohawk* prospectively only. On the face of it, that simply puts a premium on precisely the delay and "foot-dragging" roundly (and correctly) condemned by the Court of Appeals in *Calvert Cliffs Coord. Comm., Inc. v. AEC*, 449 F.2d 1109, 1117 (D.C. Cir. 1971). It means that the Commission can ignore NEPA until compelled to obey (as it did prior to *Calvert Cliffs*), and that if it is alert enough to see the judicial compulsion on the horizon and act accordingly, it may immunize the effects of its delay from correction. That, after all, is what happened in *Niagara Mohawk*. As the Commission itself admitted, that ruling was prompted by the impending decision in *Ecology Action v. AEC*, 492 F.2d 998 (2nd Cir. 1974) (a fact also recognized by the Second Circuit, 492 F.2d at 1002 n. 4); even so, it was not forthcoming until after it had been required by the explicit Guidelines of the Council on Environmental Quality, 40 C.F.R. § 1500.8 (a)(4) (August 1, 1973).

The Commission's own attempted justifications for its "prospective only" ruling (J.A. 337) cannot, of course, overcome NEPA's commands—especially in light of *Calvert Cliffs*, where the Commission unsuccessfully made the same arguments for the same purpose. It is absurd to claim that the Commission's tardy recognition of its NEPA obligations authorized it to avoid fulfilling them for all prior cases. Whatever may be the case as to obligations an agency imposes upon itself, here NEPA, not the Commission, imposed the obligation. The Commission had no more authority coyly to condition its compliance with NEPA in the *Niagara Mohawk* context than it did in the context of the events leading up to *Calvert Cliffs*.

It is worth pointing out, however, that the Commission's justifications do not hold water. That it may be "burdensome" to consider energy conservation in *Midland* has no more significance than did the equally great "inconvenience" of reopening *Midland* in order to permit compliance with *Calvert Cliffs' Coord. Comm., Inc. v. AEC*, 449 F.2d 1109, 1129 (D.C. Cir. 1971)—wherein the Court of Appeals emphasized that NEPA's command to comply "to the fullest extent possible. . .does not provide an escape hatch for foot-dragging agencies" and "does not make NEPA's procedural requirements somehow 'discretionary'." To the contrary, "considerations of administrative difficulty, delay and economic cost will not suffice" to justify agency failure to comply with the statutory mandate. Here as in *Calvert Cliffs*, the Commission's argument from "inconvenience" is an excuse, not a reason—and an utterly insufficient excuse at that.

Nor is there any "governmental interest" in avoiding full application of NEPA. To the contrary, NEPA itself, 42 U.S.C. § 4331(b), establishes as the "continuing responsibility" of the federal government, through the

use of "all practicable means," the ongoing recognition and implementation of environmental goals. Section 11 of the Guidelines of the Council on Environmental Quality, adopted long before *Midland*, agrees, and squarely requires an ongoing process of improvement, implementation and re-evaluation of environmental considerations. (See 36 F.R. 7724, 7729, Apr. 23, 1971). As the Sixth Circuit held in *Environmental Defense Fund v. TVA*, 468 F.2d 1164, 1176 (6th Cir. 1972):

> "Congress' intent concerning the applicability of NEPA to ongoing federal projects is most clearly stated in § 101(b), by the terms of which it is apparent that the Congress envisaged *ongoing agency attempts to minimize harm* caused by the implementation of agency programs. This would accomplish not only *constant re-evaluations of projects already begun* to determine whether alterations can be made in existing features *or whether there are alternatives to proceeding with the projects as initially planned*, but also the consideration of the environmental impact of all proposed agency action." [Emphasis added.]

The "governmental interest" applicable here, then, is in applying NEPA—not in continuing the Commission's penchant, rejected in *Calvert Cliffs*, *supra*, of looking for ways to avoid its application. Here as in *Calvert Cliffs*, moreover, that "governmental interest" gains added force from the fact that any administrative inconvenience inherent in applying *Niagara Mohawk* to this case is purely and simply the result of "foot-dragging" by the Commission. The principles reluctantly recognized in *Niagara Mohawk* should have been applied to this case from the beginning. That the Commission's recognition of that fact was belated can hardly be used to justify still further delay in implementing that recognition. Any other result would encourage the very "foot-dragging" to which the Commission has been prone in NEPA matters, and would affirmatively

reward the Commission's tactic of delaying for as long as possible its implementation of what NEPA plainly requires.

C. Even Though They Were Not Obligated To Do So, Intervenors Directly Raised Energy Conservation Issues.

First. As a matter of law, Intervenors were not obliged to raise energy conservation issues at all as a prerequisite to the Commission's performance of its NEPA obligations. Those obligations do not depend upon, nor do they stop at, the preparation of an EIS alone. Rather, they require an agency to "consider" and "give effect to" NEPA's environmental goals, not merely to "fill archives" with impact statements. *Environmental Defense Fund v. Corps of Engineers*, 470 F.2d 289, 298 (8th Cir. 1972), *cert. denied*, 412 U.S. 931 (1973). Furthermore, the Commission's attempt to avoid environmental issues unless Intervenors affirmatively raised them was squarely addressed and rejected in *Calvert Cliffs' Coord. Comm., Inc. v. AEC*, 449 F.2d 1109, 1118-19 (D.C. Cir. 1971), and we have pointed out previously that no alleged "novelty" warranted any different result as to energy conservation issues. To the contrary, *Midland* was by no means the Commission's first encounter with the subject of energy conservation. See pp. 7-9, 34-35, *supra*.

The Government admits, in fact, that at least after *Niagara Mohawk* "it was. . .the responsibility of the applicant, the Staff, and the Board to assure that the record on energy conservation issues is adequate *whether or not intervenors raise those issues.*" Gov't Br. at 26. But, as we have previously explained (see pp. 36-38, *supra*), *Niagara Mohawk* did not amend NEPA, nor alter in the least degree the Commission's NEPA

obligations. It merely—and belatedly—recognized what those obligations were.

The entire argument over whether Intervenors adequately raised energy conservation issues, then, is really beside the point. The Commission had no more right to condition its analysis of energy conservation on whether Intervenors raised the issue than it did to refuse to consider energy conservation at all. In addition, the claim that Intervenors did not adequately raise energy conservation issues like the Commission's convenient "threshold test," is nothing but another *post hoc* rationalization, seized upon long after the fact. The Licensing Board and the Appeal Board did *not*, as we have previously explained (see pp. 10-11, *supra*), reject Intervenors' contentions as incomprehensible. At the express urging of the Staff (R. 16963), they rejected Intervenors' contentions—just as other Boards were doing in other cases, *e.g.*, *Wisconsin Electric Power Co.*, ALAB-137, 6 A.E.C. 491, 497-98 (1973); *Long Island Lighting Co.*, ALAB-156, 6 A.E.C. 831, 852 (1973)—*on the theory that they were barred as a matter of law.* The Commission's "threshold test," like its "hindsight" argument, is thus as specious, *Burlington Truck Lines v. United States*, 371 U.S. 156, 168-69 (1962), as it is an improper abdication of the Commission's NEPA responsibility to "take the initiative." *Calvert Cliffs' Coord. Comm., Inc. v. AEC*, 449 F.2d 1109, 1119 (D.C. Cir. 1971); see also *Scenic Hudson Preservation Conf. v. FPC*, 354 F.2d 608, 620 (2d Cir. 1965).

Indeed, the Commission itself seems implicitly to concede that fact. It is significant that the "threshold test" rationale for refusing to consider energy conservation in *Midland* has not been used in other cases. Even in the context of environmental contentions made (and environmental impact statements prepared) well before *Niagara Mohawk*, the Commission has not found any

such test necessary. See, *e.g.*, *Northern States Power Co.*, LBP-74-17, 7 A.E.C. 487, 492 (1974), holding any such test improper: "That the obligations imposed upon the agency by NEPA do not depend upon the case sought to be made by an intervening party cannot be seriously disputed."

Second. Furthermore, the Commission's good-for-this-day-and-train-only "threshold test," even though concocted exclusively for *Midland*, would fail to justify the Commission's *post hoc* ruling even if it were valid. The ineluctable fact is that in *Midland* the Commission was *not* obliged to exercise its imagination, or even to "take the initiative," *Calvert Cliffs' Coord. Comm. v. AEC*, 449 F.2d 1109, 1119 (D.C. Cir. 1971), in considering energy conservation issues. We do not believe extended argument is necessary to show that Intervenors adequately presented their energy conservation contentions. Those contentions (see generally J.A. 1378-85) are described at pp. 9-10, *supra*. At a minimum, they make it clear that Intervenors attacked both the accuracy of Consumers' demand estimates (which failed to take existing energy conservation programs into account) and the adequacy of the NEPA review of the Midland project (which also failed to examine whether additional energy conservation techniques—as opposed to building more power plants—might wholly or partially offset any asserted need for more power). Consumers certainly knew what Intervenors were driving at: contemporaneously with the *Midland* environmental hearings, the Michigan Public Service Commission, which has jurisdiction over Consumers, was conducting a massive inquiry into energy conservation techniques and possibilities, including "curtailing the irrational promotion of load growth," utility rate restructuring, and improving energy efficiency. *Energy Conservation And S. 2176*,

Part II, Senate Comm. on Int. & Ins. Affairs, 93d Cong., 1st Sess. (1973) 913, 918-19. Many of the same questions Intervenors raised were also part of that inquiry—just as they were of the Federal Power Commission's similar inquiry. See 37 F.R. 20045-46 (Sept. 23, 1972).

Intervenors were not, then, presenting bizarre issues.[14] To the contrary, they were making points which were already part of the working vocabulary of other State and Federal "energy agencies"—and, we submit, of the Commission as well. As previously noted, neither the Licensing Board nor the Appeal Board expressed any difficulty in understanding what Intervenors had in mind, and the Court of Appeals correctly held (J.A. 93-94, 102) that Intervenors had "forcefully pointed out" the inadequacies of the Environmental Impact Statement drafted by the Commission Staff in a manner "adequate to 'stimulate the Commission's consideration' of energy conservation alternatives." Indeed, Intervenors' energy conservation contentions closely paralleled those *upheld* by the Commission in *Niagara Mohawk*. See Supp. R. 25112 at 7-15.

Far from abandoning the "rule of reason" developed by its own decisions, then, the Court of Appeals—as its opinion carefully explains, J.A. 100-102—applied well

[14] Consumers (Br. at 26) finds "vague" Intervenors' reference to means of generating electricity "not now known to man." But its own load growth estimates include such demand-increasing factors as "the invention of new electricity-using appliances . . . that are not yet envisioned." 1977 Hrgs., Tr. 1959. As for Intervenors' reference to "social stimuli," Consumers Br. at 26, see *Energy Conservation And S. 2176*, *supra*, at 915 (comments of a member of the Michigan Public Service Commission about "outdated attitudes" and "policy assumptions").

settled principles in holding Intervenors' contentions sufficiently clear to merit consideration. It held only that the Commission could not, as it sought to do (see J.A. 97-100, 332), compel Intervenors, as a prerequisite to even being permitted to raise the issue, to *prove* both that energy conservation alternatives were feasible and that they would *entirely* obviate the need for the project under discussion. That was correct. Both the Council on Environmental Quality and the courts had emphatically held—long before the Commission invented its "threshold test"—that NEPA imposes no such limitation. *Hearings on the Calvert Cliffs Court Decision*, Part II, Senate Comm. on Int. & Ins. Affairs, 92d Cong., 1st Sess. (1971) 394-97; *Calvert Cliffs' Coord. Comm., Inc. v. AEC*, 449 F.2d 1109, 1119 (D.C. Cir. 1971); *Natural Resources Defense Council v. Morton*, 458 F.2d 827, 836 (D.C. Cir. 1972).

D. As The Commission Recognized In Niagara Mohawk, Consideration Of Energy Conservation Alternatives, Like Other NEPA Alternatives, Is Part Of Its Mandate.

A final point must be made. Supported by a few of the *amici curiae*, the Government hints (Br. at 55-56) that energy conservation issues should not be considered because the Atomic Energy Act does not empower the Commission to ask whether a nuclear plant is needed before licensing it.[15] In effect, that questions whether

[15] See the Brief for *amici curiae* Hans A. Bethe, *et al.*, in No. 76-528. A related claim is raised by the U.S. Labor Party as *amicus curiae* in No. 76-528: that NEPA is unconstitutional because it derogates from the "commitment to scientific and technological progress" found in the Constitution. We do not believe that that argument requires response.

NEPA applies to the Commission at all, since the consideration of need is a vital part of the overall examination of alternatives (including the alternative of not proceeding with the project) required by NEPA and by the Guidelines of the Council on Environmental Quality, 40 C.F.R. § 1500.8(a)(4).

While the issue is not properly before this Court, having not been addressed in the petitions for certiorari, and also is foreclosed by the Commission's own *Niagara Mohawk* decision, it should be mentioned that NEPA's chief Congressional sponsor made it clear that NEPA was intended to foreclose precisely the "no mandate" argument now tendered: "No agency will be able to maintain that it has no mandate or no requirement to consider the environmental consequences of its actions." See *Calvert Cliffs' Coord. Comm., Inc., v. AEC*, 449 F.2d 1109, 1112-13 (D.C. Cir. 1971). By establishing the goal of preserving our environment and requiring agencies to "consider and give effect to" that goal, see 42 U.S.C. § 4332(2)(A), (2)(B), and by mandating that, "to the fullest extent possible," Federal law be "interpreted and administered in accordance with" that goal, 42 U.S.C. § 4332(1), Congress enshrined in the mandate of each Federal agency the affirmative duty to consider environmental protection. As NEPA itself provides, 42 U.S.C. § 4335, that duty is supplementary and in addition to the existing authority of Federal agencies, not subordinate to limitations on that authority "implied" from the fact that the governing statute happens not to mention environmental matters.

In fact, the States who are the chief alleged beneficiaries of the "no mandate" argument themselves do not agree with it. Twenty-four States—including Michigan, the site of the Midland project—have joined as *amici curiae* here, urging *affirmance* of the Court of

Appeals' rulings in *Midland* as well as in the "fuel cycle" case. Their Brief emphatically states (at p. 8 n. 12) that:

> ". . . energy conservation is an alternative to licensing which must be actively considered by responsible federal officials prior to final decisions on proposed energy related actions."

And they reiterate (at pp. 4, 27) the same point we are making here (and which has special force in *Midland* as unfolding events attest to the accuracy of Intervenors' energy conservation contentions): that if the benefits of proceeding with a nuclear project like *Midland* do not outweigh its costs, environmental and otherwise, "it is far better that we discover that now" rather than waiting until the damage has become irreparable. The facts we now know underscore the correctness of the Court of Appeals' ruling, as a means of avoiding what the States properly term (at p. 4) "hasty or otherwise irrational decisions based on incomplete assessments of all the true costs of and alternatives to proposed licensing actions."

II.

THE COURT OF APPEALS CORRECTLY HELD THAT THE MIDLAND ACRS REPORT WAS FATALLY FLAWED—A FACT WITH SERIOUS NEPA, AS WELL AS SAFETY, IMPLICATIONS.

Before the Commission, Intervenors had not only challenged the adequacy of the cryptic ACRS Report, and its reference to unidentified "other problems" which should be given "due consideration" if the Midland plant was to be safe (see pp. 13-14, *supra*), but had sought discovery from the ACRS concerning the meaning and basis of the Report. Although the Licensing Board argued at one point that discovery would be improper

(because the ACRS was not a "party") and would impair "informal communication of views" during the pre-hearing Staff-Consumers-ACRS review process, its primary ground for denying discovery—and the sole ground for the Appeal Board's affirmance—was that the ACRS Report is essentially a public relations gimmick having no substantive significance. J.A. 186 n. 2, 275-78. As the Appeal Board put it (J.A. 275):

> "The ACRS letter is only admitted as part of the record to show compliance with statutory requirements and not for the truth of any of the statements therein."

It is on that curious proposition that the following discussion focuses, since that was the ground on which the Commission relied. "[W]e may not supply a reasoned basis for the agency's action that the agency itself has not given. . . ." *Bowman Transportation, Inc. v. Arkansas-Best Freight System, Inc.*, 419 U.S. 281, 285-86 (1974). While we also address the argument that discovery would be inappropriate or burdensome, we believe that to be a subsidiary point, It does not excuse the ambiguity and obscurity of the ACRS Report; rather, it goes only to the question of what remedy is appropriate. And in any case it is largely a *post hoc* rationalization entitled to little weight. *Burlington Truck Lines v. United States*, 371 U.S. 156, 168-69 (1962).

A. The ACRS Report Is Far More Than A Public Relations Gimmick. It Has Substantial Significance, As To Both Safety And Environmental Issues.

It will not do blandly to announce that the ACRS is a meaningless body whose statutorily required review has no significance and whose statutorily required report has no meaning. We saw at pp. 12-13, *supra*, that the ACRS played a major role in the review, and its Report

a major role in the approval, of the Midland project. Even the Government, moreover, admits that the Commission "needs" the ACRS as a source of "independent expert technical advice to supplement its own understanding and the work of its Staff" (Br. at 67), and Congress obviously thought no less highly of the ACRS when it required not only that the ACRS report on each reactor but that the reports be made public.[16] Far from filling a minor public relations function, the ACRS Report was intended by Congress to bring out in the open all possible safety problems besetting a nuclear reactor in order to promote public discussion:

> "Having established the [ACRS] . . ., it was thought that its functions would be best served if its reports should be made public, and if the facilities of the type on which its report were required should be licensed only after a public hearing.
>
> "The Joint Committee concluded that *full, free and frank discussion in public of the hazards involved* in any particular reactor would seem to be the most certain way of assuring *that the reactors will indeed be safe* and that the public will be fully apprised of this fact." [Emphasis added.]

S. Rep. No. 296, U.S. Code Cong. & Adm. News, 85th Cong., 1st Sess. (1957) 1803, 1813-14. Indeed, the object of the exercise was to prevent the licensing of reactors not found safe by the ACRS. See *Union of Concerned Scientists v. AEC*, 499 F.2d 1069, 1073 n. 5, 1075 n. 13

[16] In fact, the Government all but disavows the "no-substantive-significance" argument on which the Commission relied, preferring instead to argue—erroneously, as shown at pp. 12-13, *supra*, and in the text, *infra*—that Congress did not have "public evaluation of the basis for the ACRS position" in mind when it enacted 42 U.S.C. § 2232(b). Gov't Br. at 69. But that begs the question. In *Midland*, as the Commission Staff has now admitted, it is not only the basis for the ACRS' position, but *the position itself*, which is obscure. And if the ACRS' findings are in fact a part of the Commission's substantive consideration, it is all the more important (to the integrity of the Commission's decision and the mandatory public hearings, as well as to Intervenors' ability to deal with safety issues) that the findings and their basis be clear.

(D.C. Cir. 1974). Deliberately conferring upon the ACRS what amounts to a veto power over reactor licensing hardly signifies an intent to deprive its Reports of substantive meaning.

The Commission's attempt to downgrade the ACRS Report in *Midland*—and in other cases, see *Arkansas Power & Light Co.*, ALAB-94, 6 AEC 25 (1973)—is not surprising. The Commission initially opposed the requirement that ACRS reports be made public, S. Rep. No. 296, U.S. Code Cong. & Adm. News, 85th Cong., 1st Sess. (1957) 1803, 1816, and has unsuccessfully tried to repeal the mandatory ACRS review requirement. See *Selected Materials On The Calvert Cliffs Decision, Its Origin And Aftermath*, Joint Comm. on Atomic Energy, 92d Cong., 1st Sess. (Comm. Print 1972) 410 (speech by AEC Chairman). But the Commission's attempt to accomplish by *ipse dixit* what Congress has refused to do cannot be sanctioned.

Quite apart from the legislative history, Commission decisions themselves have made it clear that ACRS reports are not mere public pablum. In this case itself, far from ignoring the substantive significance of the *Midland* ACRS Report, Consumers explicitly argued to the Licensing Board that ACRS findings were so substantively reliable as to warrant a shift in the burden of proof on safety issues (R. 329 at 8-10), and the Staff's *Midland* Safety Evaluation—on which the Licensing Board concededly relied (see, *e.g.*, J.A. 195-98)—explicitly relied in turn upon the ACRS Report. See R. 2515 at pp. 81-82, 88-92, and see *Union of Concerned Scientists v. AEC*, 499 F.2d 1069, 1078 (D.C. Cir. 1974), correctly noting that the role of the Licensing Board is to "review a record already compiled by the Staff *and the ACRS*, who *have responsibility* for the sufficiency of that record." That echoes the long-standing view of the staff of the Joint Committee on Atomic Energy:

> "The main function of the [license] hearing is to present the combined judgments of the applicant, Staff, *and ACRS* that the proposed reactor is safe." [Emphasis added.]

Improving The AEC Regulatory Process, Joint Comm. on Atomic Energy, 87th Cong., 1st Sess. (Comm. Print 1961), Vol. I, pp. 21-22, 48-49; see also *Id.*, Vol. II, App. 5, p. 141.

Quite recently, moreover, one of the Commission's Licensing Boards held (in an opinion by both of the scientist members of the panel) that cryptic ACRS language identical to that involved here not only defied comprehension—as the Staff has admitted in *Midland*, see pp. 20-21, *supra*—but severely hampered the entire regulatory process, failed to provide "sufficient information to fully understand ACRS intent," and presaged real difficulties at the operating license stage. At that point:

> ". . . the ACRS will review the operating license application and could correct the Staff's interpretation [that "due consideration" did not mean actual resolution of problems] at that distant point in the future, if required. *Yet at that point, the ACRS might have to advise withholding an operating license or modifying a plant that could result in delay if the Staff's interpretation of the ACRS letter is wrong.*" [Emphasis added.]

Tennessee Valley Authority (Hartsville Nuclear Plant), LBP-77-28, 5 N.R.C. 1081, 1118 (1977).

The Board members might well have added that the consequences of a wrong guess are far more serious than delay alone. Suppose, for example, that when (and if) the Midland project reaches the operating license stage, the ACRS announced that its original, but vague, Report contemplated a design modification which should have

been made during construction in order to ensure safe operation. Not only will the huge sums spent during plant construction have *pro tanto* been wasted, but additional sums will have to be spent in order both to tear down what has already been completed and to rebuild it in a proper fashion.

From a safety standpoint, an even more serious possibility—even, perhaps, a likelihood in view of the Commission's admitted "reluctance . . . to depart from even tentative prior conclusions," *Potomac Electric Power Co.* (Douglas Point Stations, Units 1 & 2), ALAB-277, 1 N.R.C. 539, 552 (1975)—is that when the plant reaches the operating license stage, the immense sums already invested in construction will result in a tendency to forego design modifications otherwise desirable, and thus to relax or overlook safety criteria in the interests of economics. As the Appeal Board recently commented in *Midland:*

> "The more that is expended, the less likely it is that, on account of environmental [and, we suggest, safety] considerations, either the cost-benefit balance will be tipped against the plant or potential alternatives will remain feasible."

Consumers Power Co. (Midland Plant, Units 1 & 2), ALAB-395, 5 N.R.C. 772, 779 (1977). That is why it is uniformly conceded that the review at the operating license stage is largely a formality, and that the real decisions are made (as here) during the construction license process. *Union of Concerned Scientists v. AEC*, 499 F.2d 1069, 1076 (D.C. Cir. 1974); see also *Power Reactor Development Co. v. Electricians*, 367 U.S. 396, 412 (1961). In this case itself, in fact, a Consumers witness testified during the post-remand hearings that as construction of the Midland plant continues, safety-related design or construction modifications become increasingly unfeasible. 1977 Hrgs., Tr. 1066-68, 1138.

What is most important, however, is that the fundamental purpose of the ACRS Report is to promote "full, free, and frank" discussion of safety issues in order to "assur[e] that the reactors will indeed be safe"; ACRS' statutory mandate, after all, is to "advise the Commission with respect to the hazards involved at any facility" so that they can be corrected, not so that they can be swept under the rug. S. Rep. No. 296, U.S. Code Cong. & Adm. News, 85th Cong., 1st Sess. (1957) 1803, 1813-14, 1825. That is also one of the major purposes of the mandatory public hearings on construction license applications; see 10 C.F.R. § 2.104(b)(1). It is a far cry from an exercise in public relations—and it is exactly what the cryptic ACRS Report frustrated in *Midland.* The Commission itself has admitted that new "safety issues . . . may be unearthed in connection with the renewed consideration of the ACRS letter" following the Court of Appeals' remand, *Consumers Power Co.* (Midland Plant, Units 1 & 2), ALAB-395, 5 N.R.C. 772, 779 n. 24 (1977), and the Staff has admitted that new cost-benefit concerns may also be presented. See pp. 20-21, *supra.* In view of those admissions, it is absurd to say that the Report can be thrust aside as substantively meaningless. We turn now to the question of how best to remedy the Report's fatal opacity.

B. The Court Of Appeals' Direction To The Commission To Obtain Clarification Of The Midland ACRS Report Was Proper. It Was The Least The Court Could Have Done Under The Circumstances.

> "A party is entitled, of course, to know the issues on which decision will turn and to be apprised of the factual material on which the agency relies for decision so that he may rebut it."

Bowman Transportation, Inc. v. Arkansas-Best Freight System, Inc., 419 U.S. 281, 288 n. 4 (1974). As we saw at pp. 20-21, *supra*, and as the Licensing Board explained in *Tennessee Valley Authority* (Hartsville Nuclear Plant), LBP-77-28, 5 N.R.C. 1081, 1119 (1977), however, the ACRS' opaque *Midland* language fell short of even the Court of Appeals' hope that it gave the Commission "the benefit of ACRS members' technical expertise" (J.A. 108). Certainly it did not tell Intervenors what the facts and issues were, let alone further the Congressionally mandated "full, free, and frank discussion" of those facts and issues. To the contrary, the opacity of the ACRS' *Midland* Report has prevented a full analysis of safety issues *in the license hearings themselves.* The Licensing Boards "are instructed to rely on the ACRS review unless an item is controverted." *Tennessee Valley Authority, supra*, 5 N.R.C. at 1119. But one cannot "controvert"—certainly not with the "particularity" required by 10 C.F.R., Part 2, App. A, ¶ III(a)(1)—what one cannot understand, and it is now admitted that no one, including the Licensing Board and the Commission Staff, understands the ACRS Report.

That the ACRS Report was not fully analyzed during the *Midland* hearings is bad enough; it is intolerable in light of the Staff's admission that it too is at a loss. Under those circumstances, the Court of Appeals acted well within the bounds of propriety when it directed the Commission to obtain clarification from the ACRS—a step, as the Government admits (Br. at 69) to which the Commission itself has resorted on other occasions, and the omission of which in *Midland* was irresponsible in light of the Staff's conceded confusion. In fact, the court could and should have gone farther. Its rejection of Intervenors' argument that discovery from the ACRS should have been permitted, which the

Court of Appeals premised on the "collegial" character of the ACRS and this Court's holding in *United States v. Morgan*, 313 U.S. 409, 422 (1941), evidences an overly tender regard for the ACRS. This Court has long held that due process forbids agencies to immunize facts and issues from scrutiny. *Bowman Transportation, Inc. v. Arkansas-Best Freight System, Inc.*, 419 U.S. 281, 288 n. 4 (1974), citing *Ohio Bell Telephone Co. v. Public Utility Comm.*, 301 U.S. 292, 300, 302-03 (1937). What Mr. Justice Cardozo wrote for a unanimous court in *Ohio Bell*, 301 U.S. at 302, is directly applicable to the ACRS "other problems" language in this case from both the safety and the environmental cost-benefit analysis standpoints:

> "From the standpoint of due process—the protection of the individual against arbitrary action—a deeper vice is this, that *even now we do not know the particular or evidential facts of which the Commission took judicial notice and on which it rested its conclusion. Not only are the facts unknown; there is no way to find them out.*" [Emphasis added.]

If "hearings and appeals are to be more than empty form," *Id.* at 303, that must not be permitted. Only by securing some sort of explanation from the ACRS can the meaningful public discussion and resolution of both safety and environmental issues which Congress mandated in the Atomic Energy Act and in NEPA be secured, and only in that way can a reviewing court assure itself that the Commission has "considered all relevant factors." *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 415 (1971).

Under those circumstances, as this Court made clear in *Overton Park, supra*, 401 U.S. at 420, nothing in *United States v. Morgan*, 313 U.S. 409 (1941), prevents a court from requiring an administrative body to explain what it means. That is doubly true here, where Congress

explicitly intended that the ACRS Report promote "full, free, and frank" public discussion of safety issues and where exactly the same "action-forcing" requirement of public disclosure of agency thinking lies at the heart of NEPA's procedural requirements. See *Environmental Defense Fund v. Froehlke*, 473 F.2d 346, 351 (8th Cir. 1972).

Far from constituting an improper intrusion into the administrative process, then, the Court of Appeals' decision stopped well short of granting Intervenors the full relief to which they were entitled. The court could and should have insisted that the Commission provide reasonable discovery, subject to any necessary safeguards to prevent it from becoming unduly burdensome, into the meaning and bases for the ACRS *Midland* Report. But the court did much less. It simply told the Commission to do here what, as the Government now admits (Br. at 69), *the Commission itself has done on other occasions*—to send the report back to the ACRS for clarification.[17] Under the circumstances, that was the least the court could have done, and was eminently proper.

III.

THE COURT OF APPEALS ACTED PROPERLY IN REMANDING MIDLAND TO THE COMMISSION FOR A RESTRIKING OF THE NEPA COST-BENEFIT ANALYSIS.

In Parts I and II of this Brief we have shown that the Court of Appeals was right in holding that the Commission seriously erred in refusing even to entertain

[17] Given the ACRS' present refusal to comply with the Licensing Board's request for an explanation of its *Midland* Report (see p. 21, n. 9, *supra*), affirmance of the Court of Appeals' ruling also seems necessary in order to help the Commission pursue the very self-devised remedy it has previously used.

(much less consider) energy conservation alternatives to the Midland project on the ground that the whole subject was "beyond our province", and in refusing to seek an explanation of the cryptic ACRS Report.

Standing alone, either of those errors required remand of *Midland* to the Commission. Both errors profoundly impaired the NEPA cost-benefit analysis, by foreclosing consideration of alternatives to (and safety-related design modifications of) the Midland project and by preventing full examination of the cost of coping with added safety problems and its impact on the project. As we have seen, those are by no means trivial matters. See pp. 18-21, *supra*. In addition, the ACRS error also prevented the full discussion and resolution of *Midland* safety issues demanded by Congress—again, far from a minor or secondary matter.

Neither Consumers nor the Government challenges the appropriateness of the Court of Appeals' statement (J.A. 109) that, since a remand was required in any event, on remand the Commission should "take into account the changed circumstances" concerning the Consumers-Dow Chemical Company relationship. To the contrary, Consumers twice assures this Court (Br. 17, 47) that the Commission has ample power to reexamine those circumstances. We add, however, that in the context of this case both NEPA and the Commission's own decisions impose the *obligation* to consider the drastic alterations in the Consumers-Dow relationship described at pages 22-24, *supra*—especially since, as the Licensing Board reaffirmed in its suspension ruling (see pp. 23-24, *supra*) they go to the very heart of the *Midland* project.

That would be true even if the Dow issue were the only reason for restriking the cost-benefit analysis. Whatever might be the case if nothing more than a purely discretionary denial of reconsideration were involved, see *ICC v. Jersey City*, 322 U.S. 503 (1944), here we have more. Here the Commission itself *did* conclude that the Dow issue warranted further consideration, and *did* (albeit grudgingly) reopen the proceeding by demanding and reviewing the renegotiated Dow-Consumers contracts. J.A. 350-51. Nothing in *Jersey City* remotely justifies the Commission, *having made that decision*, to conduct its reopened inquiry wholly *ex parte* and without notice to Intervenors. Nor does *Jersey City* authorize a decision on reconsideration based on inaccurate reasons. Here, however, the Commission concluded that the renegotiated Dow-Consumers contracts were unimportant on the astonishing ground—flatly contradicted by the Environmental Impact Statement and the initial decision of its own Licensing Board (see p. 14, *supra*), and again repudiated by the reconvened Licensing Board (see pp. 23-24, *supra*)—that the closing of Dow's fossil-fuel plant "was not a determinative factor in its cost-benefit analysis." See page 15, *supra*. See also 28 U.S.C. § 2347(c), explicitly authorizing the Courts of Appeals to order the taking of additional evidence by, *inter alia*, the Commission (28 U.S.C. § 2342(4)). The only requirements are that the evidence be "material" and that "reasonable grounds" exist for not having previously offered it—both clearly satisfied with regard to the Dow evidence in *Midland*.

In addition, the "discretion" customarily invoked in discussing requests for reconsideration must, in a case like this one, be considered in light of NEPA. It is well settled that NEPA demands ongoing and continuing efforts at accommodating proposed Federal action to environmental needs, and that not merely an initial

analysis but also "constant reevaluations of projects already begun" must be made "to determine whether alterations can be made . . . or whether there are alternatives to proceeding with the projects as initially planned." *Environmental Defense Fund v. TVA*, 468 F.2d 1164, 1176 (6th Cir. 1974); 40 C.F.R. § 1500.13; see also *Hudson River Fishermens' Ass'n v. FPC*, 498 F.2d 827, 832-33 (2d Cir. 1974).

It would make no sense to construct the entire Midland facility absent Dow participation; the Final Environmental Impact Statement explicitly so states, and the reconvened Licensing Board agrees. See pages 23-24, *supra*. But the developing facts suggest that we may have reached precisely that state of affairs, as the reconvened Licensing Board suggested by describing Dow's continued participation as "speculative." See pages 22-24, *supra*. Under those circumstances, the Commission's own decisions, as well as the cases cited above, require a fresh look at the facts. As the Commission held in *Commonwealth Edison Co.*, ALAB-153, 6 A.E.C. 821, 823-24 (1973):

> ". . . [I]t is not proper to resolve a major environmental question on the basis of a set of facts existing in the past if there is good reason to believe that there may have been an appreciable, and material, change in the factual situation."

See also *Consolidated Edison Co.*, ALAB-188, 7 A.E.C. 323, 407 (1974). And when the energy conservation and ACRS issues are added to the Dow issue, the need for a fresh look—on safety as well as environmental grounds—is inescapable.

Thus the Court of Appeals acted properly in remanding *Midland* to the Commission for a fresh look at, and recalculation of, costs and benefits, regardless of wheth-

er its decision in *Vermont Yankee* concerning "fuel cycle" issues independently required such a remand. With regard to both the ACRS issue and the energy conservation issue, the record before the Court of Appeals established beyond cavil that the Commission had *not* taken a "hard look" at those problems, and had *not* considered all the relevant factors. *Kleppe v. Sierra Club*, 427 U.S. 390, 410 (1976); *Citizens to Preserve Overton Park v. Volpe*, 401 U.S. 402, 415 (1971); *Ethyl Corp. v. EPA*, 541 F.2d 1, 34-36 (D.C. Cir. 1976). And with regard to the Dow issue, the court had no alternative under NEPA but to point out that any recalculation of costs and benefits would be ridiculously incomplete without reexamination of the drastically changed facts concerning the central reason for building Midland in the first place.

While they are thus not controlling here (and are fully discussed in the Brief of respondent Natural Resources Defense Council in No. 76-419, which we adopt), we think it important to make two brief points concerning the "fuel cycle" issues.

To begin with, the Court of Appeals did not overturn the Commission's conclusion that fuel cycle matters are best dealt with in the rulemaking context. To the contrary, the Court of Appeals explicitly found the Commission's preference for the rule-making approach to be acceptable (J.A. 39-40 n. 17). It held only that, since it had found the Commission's rule-making to be deficient *for want of an adequate record* (as the Commission has stated, see 42 F.R. 13803, Mar. 14, 1977[18]), the invalid

[18] See also the Brief of the 24 States as *amici curiae*, at 10-11. Since the United States has believed from the beginning that the "fuel cycle" ruling was based on the inadequacy of the record (Brief for the Federal Respondents in reply to the petitions for certiorari, p. 9), and the Commission now agrees, it is difficult to understand why the Government argues the contrary.

rule-making could no longer serve as a basis upon which to justify a refusal to consider fuel cycle issues in license proceedings.

Far from constituting an unwarranted intrusion into the Commission's deliberative processes, that holding merely states the obvious. No one claims here that the Commission can, consistently with NEPA, ignore outright the serious and unresolved issues posed by the environmental effects of producing, transporting, and storing nuclear waste. But if the attempt to deal with the issues by rule is invalid for want of an adequate record (as the Court of Appeals concluded it was), then, and until a valid rule is promulgated, the issues cannot be excluded from a license proceeding. That is all the Court of Appeals held with respect to the *Midland* "fuel cycle" issues.

Similar problems beset Consumers' argument concerning the rule-making itself. In effect, Consumers would have this Court abandon entirely judicial review of rule-making proceedings, by holding that the courts may not question an agency judgment either concerning the adequacy of the evidence on which the rule is based (Consumers' Br. at 46) or concerning the procedures adopted in the rule-making. But even the Government concedes (Br. 36-37) that consideration of the adequacy of the evidence before the Commission is well within "the established bounds for judicial review of agency action", and is not rendered any less so by "the presence of highly technical and specialized material in the record." And the short answer to the other half of Consumers' attempt to abolish judicial review of rule-making is again provided by the Government. The Government conceded in the Court of Appeals (see J.A. 44) that 5 U.S.C. § 553 does not pretend to announce the

outer limits of rule-making procedural safeguards, and the legislative history the Government quotes here expressly so states (S. Rep. No. 752, 79th Cong., 1st Sess., 14-15 (1945)):

> "This subsection [now 5 U.S.C. § 553(c)] states . . . the *minimum requirements* of public rule-making procedure short of statutory hearing. . . . *Matters of great import, or those where the public submission of facts will be either useful to the agency or a protection to the public, should naturally be accorded more elaborate public procedures.*" [Emphasis added.]

Furthermore, the extent to which the Commission's "fuel cycle" rule-making procedures actually assured performance of its plain duty to "consider and give effect to" all pertinent environmental factors, see *Environmental Defense Fund v. Corps of Engineers*, 470 F.2d 289, 298 (8th Cir. 1972); *Kleppe v. Sierra Club*, 427 U.S. 390, 409 (1976), was not only a permissible question for the Court of Appeals to consider, but a genuine one in light of its past experience with the Commission. These cases were the court's sixth encounter with the Commission's NEPA activities in the first five years since NEPA's passage—a period marked by the Commission's reluctance to follow NEPA at all unless compelled to do so.[19] And even if the Court did reject the "fuel cycle" rule-making on procedural grounds (see Gov't Br. at 36-37), it adopted an eminently satisfactory method of ensuring that the Commission would do its

[19] The earlier cases are *Calvert Cliffs' Coord. Comm., Inc. v. AEC*, 449 F.2d 1109 (D.C. Cir. 1971); *Scientists' Inst. for Pub. Info., Inc. v. AEC*, 481 F.2d 1079 (D.C. Cir. 1973); *Gage v. AEC*, 479 F.2d 1214 (D.C. Cir. 1973); *Union of Concerned Scientists v. AEC*, 499 F.2d 1069 (D.C. Cir. 1974); *Carolina Environmental Study Group v. United States*, 510 F.2d 796 (D.C. Cir. 1973).

job. Rather than engaging in a debate over what procedures would suffice, the court left that determination to the Commission, telling the Commission only to ensure that its procedures would afford "procedural safeguards" appropriate "to prevent erroneous decisions on the merits from occurring." See *Silver v. New York Stock Exchange*, 373 U.S. 341, 366 (1963); *Ethyl Corp. v. EPA*, 541 F.2d 1, 34-36, 66-67 (D.C. Cir. 1976). Indeed, the Court of Appeals asked the Commission to do no more than Section 102 of NEPA, 42 U.S.C. § 4332, commands: to provide procedures which of themselves would compel the required "hard look" at environmental concerns. See *Kleppe v. Sierra Club*, *supra*, 427 U.S. at 409, 410 n. 21. That was not error.

CONCLUSION

For the foregoing reasons, the judgment of the Court of Appeals in No. 76-528 should be affirmed. Regardless of the outcome of No. 76-419 (which we believe should also be affirmed), the ruling of the Court of Appeals in No. 76-528, remanding *Midland* to the Commission for recalculation of costs and benefits, was correct. As the States point out at page 4 of their *amici curiae* Brief, the Court of Appeals' ruling is no threat to sound administrative decisionmaking. It merely seeks to avoid

what happened in *Midland:* a "hasty" and "irrational"[20] decision "based on incomplete assessments of all the true costs of and alternatives to proposed licensing actions."

Respectfully submitted,

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[20] Part of that "irrationality" flows from arguments (like that suggested by Consumers, Br. at 6 n. 1) that incorrect decisions may be immune from redress, or even review, on the ground that the utility has already begun work on the project. If accepted, that argument reduces the entire judicial review process to an idle ritual. What the Court of Appeals held here is that environmental and safety issues had not been fully evaluated when the *Midland* construction permits were granted. Everyone agrees that a full evaluation of those issues is a prerequisite to a valid permit grant, and the post-remand hearings have shown that such an evaluation uncovers major problems with the project. To say that, although the analysis was not made to begin with, it is now a useless exercise because in the interim Consumers has spent money on the project (funds which may be largely recoverable in any event), is to indulge in economic blackmail—to claim that the law must not be enforced because it would cost too much. To act on that basis would encourage administrative noncompliance with controlling statutes, by advising persons in Consumers' position that if they can only delay long enough (or spend fast enough) their noncompliance will become unreviewable. That is not only fallacious but dangerous, because it suggests that justice can, in practice, be bought. Even if there is a hole in Consumers' pocketbook—a matter best addressed by the Michigan Public Service Commission—it cannot excuse noncompliance with NEPA or the Atomic Energy Act. Affirmance of the Court of Appeals' decision is thus all the more necessary, so that the sort of foreclosure of meaningful judicial review by *fait accompli* in which Consumer has engaged can be given the short shrift it deserves.

In The

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,
Respondents.

No. 76-528

CONSUMERS POWER COMPANY,
Petitioner,

v.

NELSON AESCHLIMAN, *et al.*,
Respondents.

BRIEF FOR RESPONDENTS NATURAL RESOURCES DEFENSE COUNCIL INC., ET AL. IN NO. 76-419

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Respondents.

BRIEF FOR RESPONDENTS NATURAL RESOURCES DEFENSE COUNCIL INC., ET AL. IN NO. 76-419

QUESTIONS PRESENTED

1. Does a Court of Appeals act properly when it remands to an agency upon a finding that the agency has promulgated a rule on the basis of a grossly inadequate record?

2. Whether the Court of Appeals was correct in this case when it found the record of the Nuclear Regulatory Commission's "generic" rulemaking proceeding on the environmental impact of the uranium fuel cycle failed to meet either the disclosure requirements of the National Environmental Policy Act, or the Administrative Procedure Act's requirement to engage in reasoned decision-making?

3. Whether a nuclear power station may be licensed to operate with no consideration of the environmental impact of the wastes it will generate?

THE NUCLEAR FUEL CYCLE

Electricity from nuclear power plants is produced from using the energy released in nuclear fission (splitting the atom) to boil water and create steam. The fissionable material in the present "light water" reactors is uranium-235 ("U-235"). U-235 represents only 0.71 percent of natural uranium. The rest is composed of the heavier isotope, U-238. Within a nuclear power reactor some of this U-238 is converted into a fissionable material, plutonium-239 ("Pu-239"),[1] which itself can be used as reactor fuel, if separated from the remaining uranium and other radioactive waste in a fuel "reprocessing" plant. The spent fuel removed from a nuclear reactor each year contains some 200 kilograms of Pu-239.[2]

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[1] Plutonium is so dangerous that it has been suggested that a single dust particle of plutonium if inhaled might cause lung cancer. Lushbauch & Langham, *A Dermal Lesion from Implanted Plutonium*, 86 ARCHIVES OF DERMATOLOGY at 121-24 (October 1962).

[2] "Final Generic Environmental Statement on the Use of Recycled Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors ("GESMO")," U.S. Nuclear Regulatory Commission, NUREG-0002 (August 1976) II-3.

Whether or not reprocessed, spent fuel is a highly radioactive waste material, contaminated by vast quantities of radionuclides that must be kept isolated from all life for periods of hundreds to hundreds of thousands of years. In addition, if plutonium-239 is extracted from spent fuel by a reprocessing facility, the resulting refined plutonium fuel can be converted into an atomic weapon with widely disseminated information and technology available to even technologically backward nations or terrorist groups.[3]

A. The Dangers from Nuclear Wastes.

The Director of the Nuclear Regulatory Commission's Division of Waste Management described the significance of the waste disposal problem in the rulemaking under review here. "Some people," he said,

> "feel that this is the most difficult problem associated with the effective use of nuclear energy to generate electrical energy. . . ."

App. 776.

A radioactive isotope of the element cesium can be used to illustrate the dangers associated with the radioactive wastes. A 1000 megawatt nuclear reactor will at the end of one year's operation have an inventory of about 3 million curies (a measure of radioactivity) of the radioactive isotope, cesium-137 ("Cs-137").[4] By the year 2000, the Nuclear Regulatory Commission ("Commission")[5] projects 500 such reactors.[6] By that time,

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[3] WILLRICH, M. AND TAYLOR, T.B., NUCLEAR THEFT: RISKS AND SAFEGUARDS (Ballinger Publishing Co., Cambridge, Mass. 1974) 5-21.

[4] GESMO, *supra*, IV C-82.

[5] The Nuclear Regulatory Commission succeeded to the authorities relevant to this case formerly possessed by the Atomic Energy Commission during the course of this litigation. Hence the term "Commission" is used to refer to both bodies throughout this brief.

[6] GESMO, *supra*, S-12.

the Nation's total accumulated inventory of Cs-137 will be approximately 15 billion curies. The International Commission on Radiological Protection has suggested a maximum permissible exposure to Cs-137 for an individual.[7] If only one one-hundred-millionth of the accumulated inventory of Cesium-137 were transferred evenly to the American population projected for that year, this maximum "body burden" would be received by every person in the United States. Moreover, one hundred years later this material will have decayed by only a factor of 10. Similarly, by the year 2000 it is projected that there will be an inventory of plutonium 239 equal to some 10 million billion body burdens.[8] Because of its extremely long "half-life" (decay period), this material will not become harmless for approximately 250,000 years. Thus because of their extreme toxicity and immensely long decay periods, the radioactive materials in nuclear wastes must be isolated from the environment for, essentially, perpetuity.

In 1960, a committee of the National Academy of Sciences concluded that:

> ". . . no existing AEC installation is in a geologically acceptable location for disposal of highly radioactive liquid waste and . . . future waste-producing plants might also be placed in unfavorable locations if the feasibility of safe ultimate disposal is disregarded. The Committee also expressed its belief that there is serious need to get beyond the problems of disposal at existing installations that were located with little regard to ultimate disposal procedures, and to

[7] International Commission on Radiological Protection ("ICRP") Publication 2, *Report of Committee II on Permissible Dose for International Commission on Radiological Protection* (1959) 60.

[8] GESMO, *supra*, S-16; ICRP, Publication 2, *supra*, 82.

> give additional emphasis to the job of finding safe permanent disposal sites." [9]

Since then, there has been little further progress towards developing an acceptable means of disposing of these wastes. After substantial investigation, in 1971 the Commission decided to begin a demonstration project to demonstrate the feasibility of a permanent disposal facility in an abandoned salt mine at Lyons, Kansas. It claimed before the Joint Committee on Atomic Energy that all the necessary studies confirming the mine's suitability had been completed. Subsequent to the Congressional budget hearings, the Commission's Environmental Impact Statement on the project asserted:

> "By establishing this facility, radioactive wastes of the type previously described [including high-level wastes] will be permanently isolated from man's biosphere, thus providing a direct and lasting benefit to the environment. No significant impact on the environment resulting from the construction or operation of the proposed repository is anticipated." [10]

Citizens, scientists, private organizations, and State officials in Kansas argued vehemently that the Lyons site had not been adequately proven. It developed that they were right and the Commission wrong, for the Commission concluded after further study that the Lyons site was unsuitable:

> "In the course of the investigation, we found that there were several technical problems that had to do with Lyons itself, but not with other salt—the fact

[9] Committee on Geologic Aspects of Radioactive Waste Disposal, Division of Earth Sciences, National Academy of Sciences/National Research Council, *Report to the Division of Reactor Development and Technology, U.S. Atomic Energy Commission* (May 1966).

[10] U.S. Atomic Energy Commission, "Radioactive Waste Repository, Lyons, Kansas," WASH-1503 (June, 1971) 2.

that right next door there was another mine that decided it was going to start solution mining. We were only 1,800 feet underground away from the other mine. Solution mining could well have broken through. One thing you cannot have is water in to dissolve the salt, because then the salt is no good. That is the thing that made Lyons no good." [11]

The latest examination of the status of radioactive waste disposal conducted in 1977 by the Government Accounting Office ("GAO"), concluded that the facts still belied the Commission's optimism about waste disposal:

"After several decades of work, AEC did not, and ERDA has not yet (1) demonstrated acceptable solutions for long-term storage and/or disposal of its high level waste and (2) satisfied the scientific community that present storage sites are geologically suited for long term storage or disposal.[12]

* * * *

The Energy Research and Development Administration has begun a program to demonstrate by the mid-1980's the feasibility and safety of placing radioactive wastes in deep geological formation. GAO points out that not only has progress been negligible to date, but that future program goals are overly optimistic because the Energy Research and Development Administration faces many unsolved social, regulatory, and geological obstacles." [13]

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[11] Dr. Frank K. Pittman, Director of AEC's Waste Management and Transportation Division, *Hearings before a Subcommittee of the Committee on Appropriation, House of Representatives*, 93rd Congress, 1st Session, Part 4, Atomic Energy Commission, 172 (April 5, 1973).

[12] GAO, Report to the Congress by the Comptroller General of the U.S., *Nuclear Energy Dilemma: Disposing of Hazardous Radioactive Waste Safely* (September 9, 1977) 50.

[13] *Id.*, cover page.

B. The Risks of Nuclear Proliferation from Reprocessing Plutonium from Spent Fuel.

The extraction of plutonium from spent fuel from nuclear power plants poses grave problems of nuclear proliferation. It had been thought that non-nuclear nations could be enticed to forego the development of nuclear weapons if they were assured of assistance and cooperation in the development of peaceful nuclear programs. The 1974 explosion of a "nuclear device" by India made from plutonium extracted from the used fuel of nuclear power reactors shattered this theory.

Should the United States develop a major industry to extract plutonium-239 from spent reactor fuel, other nations, non-signatories of the Nuclear Non-Proliferation Treaty, would find it far easier to obtain the material needed to construct nuclear weapons, or to justify reprocessing plants to support their "peaceful" nuclear power stations.

Terrorist groups could also construct "low technology" nuclear bombs from stolen plutonium-239. A recent report of a Task Force on Nuclear Weapons of the Congressional Office of Technology Assessment ("OTA") composed of five nuclear weapons experts either presently or previously employed in the American weapons program, stated that:

"[A] small group of people, none of whom have ever had access to the classified literature, could possibly design and build a crude nuclear explosive device. They would not necessarily require a great deal of technological equipment or have to undertake any experiments. Only modest machine-shop facilities that could be contracted for without arousing suspicion would be required. The financial resources for acquisition on open markets need not exceed a fraction of a million dollars." [14]

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[14] U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, NUCLEAR PROLIFERATION AND SAFEGUARDS (July 1977) 140-141.

After considering the potential benefits of reprocessing plutonium together with the dangers associated with nuclear weapons proliferation, a panel of experts in an influential Ford Foundation-sponsored study concluded:

> "There is no compelling national interest to be served by reprocessing. There appears to be little, if any, economic incentive and it is unlikely that reprocessing and recycle could proceed without subsidy. The noneconomic benefits of reprocessing are small: fuel supply for LWRs would be little enhanced. . . .
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> * * * *
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> Health hazards and new accident risks argue against reprocessing. But the most severe risks from reprocessing and recycle are the increased opportunities for the proliferation of national weapons capabilities and the terrorist danger associated with plutonium in the fuel cycle.
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> In these circumstances, we believe that reprocessing should be deferred indefinitely by the United States and no effort should be made to subsidize the completion or operation of existing facilities. The United States should work to reduce the cost and improve the availability of alternatives to reprocessing worldwide and seek to restrain separation and use of plutonium." [15]

STATEMENT OF THE CASE

A. The Administrative Proceedings.

1. *Proceedings With Regard to the Vermont Yankee Plant.*

In June, 1971, the Commission convened an adjudicatory hearing, as required by its regulations,[16] to consider

[15] SPURGEON M. KENNY, ET AL., NUCLEAR POWER ISSUES AND CHOICES: A REPORT OF THE NUCLEAR ENERGY POLICY STUDY GROUP, sponsored by the Ford Foundation and administered by the Mitre Corporation, (Ballinger, Cambridge 1977) 333.

[16] 10 C.F.R. Part 2, § 2.700 *et seq.*

whether to issue an operating license to the Vermont Yankee nuclear power plant. Shortly thereafter, acting pursuant to the decision in *Calvert Cliffs Coordinating Committee, et al.* v. *U. S. Atomic Energy Commission*, 449 F.2d 1109 (D.C. Cir. 1971), the Commission promulgated rules under the National Environmental Policy Act ("NEPA"), 42 U.S.C. §§ 4331, *et seq.*, requiring that at each licensing proceeding, the Atomic Safety & Licensing Board ("Licensing Board") convened to conduct the proceeding should take evidence respecting the environmental impact of licensing the proposed plant. As part of this consideration, the Licensing Boards were to receive into evidence the Commission's Environmental Impact Statement for the facility, but any party to the proceeding was free to offer additional evidence or examine the reasoning and factual premises of the Statement through all the usual adjudicatory procedures. The Commission's rules also directed that in order to issue a license, the Licensing Board must find that the benefits of operating the plant would outweigh its adverse effects on the environment.[17]

Prior to the commencement of the hearing on Vermont Yankee, respondent Natural Resources Defense Council ("NRDC") propounded a series of interrogatories requesting information concerning, *inter alia*, the environmental impact of transportation, reprocessing, and ultimate disposal of the high level radioactive wastes to be produced by Vermont Yankee. The Licensing Board sustained objections to answering these questions from petitioner Vermont Yankee, taking the position that the environmental effects of the wastes generated through the operation of the plant need not be considered when the Licensing Board evaluated the adverse environmental impacts of the Vermont Yankee facility. The Commission's Atomic Safety and Licensing Appeals Board later

[17] 10 C.F.R. Part 51, § 51.52(c).

sustained the Licensing Board's decision [18] Having exhausted its administrative remedies, respondent NRDC took an appeal to the United States Court of Appeals for the District of Columbia.

2. *The Commission's Rulemaking With Regard to the Environmental Effects of the Uranium Fuel Cycle.*

Shortly after this appeal was filed, the Commission eschewed its claim that NEPA did not require consideration of any of the environmental effects of the handling of spent fuel when the Commission proposed to issue a license to a nuclear power station.[19] Paradoxically, with respect to evaluating the environmental effects of other segments of the handling of spent fuel, (particularly waste reprocessing and disposal) it proposed to abandon its normal adjudicatory procedures. Instead, the Commission proposed to convene a rulemaking for the purpose of arriving at factual conclusions regarding the environmental hazards associated with these questions.[20] The procedural rights of the parties to the rulemaking were to be drastically reduced from those afforded by the Commission in its normal adjudicatory licensing proceedings. An in-

[18] In the Matter of Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-56, App. 112, 115.

[19] The environmental impact of transporting spent fuel and "low level wastes" from the nuclear power station to a reprocessing or disposal facility were to be considered along with other environmental issues in the normal adjudicatory licensing proceeding. All other issues respecting the fuel cycle were to remain excluded from the licensing proceeding. *Id.*, App. 115.

[20] "Environmental Effects of the Uranium Fuel Cycle," Notice of Proposed Rulemaking, 37 Fed. Reg. 24191 (Nov. 15, 1972), App. 352.

The "uranium fuel cycle" was defined to encompass each phase of the production, use, and disposition of enriched uranium fuel for the purpose of generating electricity in the current generation of nuclear power stations (so-called "light water reactors"), including the reprocessing of spent fuel from the reactor and the disposal of nuclear waste products, except waste transportation.

formal hearing was to be held,[21] the Commission announced that

> "The procedural format for the hearing will follow the legislative pattern, and no discovery or cross-examination will be utilized." [22]

The Commission's Notice of Rulemaking set forth two alternative approaches for amending the Commission's regulations. The second, ultimately adopted with minor modifications, proposed that in future licensing proceedings, the Environmental Impact Statement for a proposed plant should include a one page numerical table, "Table S-3," asserted to quantify fully the environmental impacts of the entire nuclear fuel cycle, including those of reprocessing and disposing of nuclear wastes.[23] The notice invited interested persons to "submit comments and suggestions, together with relevant data and information" [24] with respect to the Commission's two proposed rules.

In announcing the proposed rulemaking, the Commission also released a document, entitled "Environmental Survey of the Nuclear Fuel Cycle," ("Survey") dated November 6, 1972, which was to provide "a basis for an informed consideration of the generic question of the environmental impact associated with the uranium fuel cycle in light water cooled nuclear power reactor licensing proceedings." [25] This Survey was to represent the primary evidentiary basis for the rule ultimately promulgated at the conclusion of the rulemaking.

[21] Notice of Proposed Rulemaking, *supra*, App. 358.

[22] "Environmental Effects of the Uranium Fuel Cycle," Notice of Hearing, 38 Fed. Reg. 49 (January 3, 1973), App. 361.

[23] Notice of Proposed Rulemaking, *supra*, App. 357.

[24] *Id.*, at 356.

[25] *Id.*, App. 355.

3. *The "Environmental Survey of the Uranium Fuel Cycle."*

The Survey addressed the environmental effects of reprocessing spent nuclear fuel through a general descriptive discussion of the normal operation of a hypothetical fuel reprocessing plant.[26] While mentioning that one reprocessing facility was then in operation,[27] and two others were under consideration,[28] the Survey did not recount any actual experience with the attempt to contain radioactive materials at the plant then in operation.[29] The chapter on fuel reprocessing was totally silent with respect to the effects on the human environment that might follow from illicit diversion by foreign governments or territorists of refined plutonium from the facility suitable for use in constructing atomic weapons, nor did it assess the probability of such an event or provide any indication of whether the Commission has any plants to prevent it.[30]

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[26] *Survey*, Chapter F, App. 580-609.

[27] *Id.*, at F-10, App. 589. Though the *Survey* stated, in November, 1972, that the operator of the plant, Nuclear Fuel Services, Inc., was considering tripling the plant's capacity, *Id.*, the plant was closed during that year and has since been abandoned. It is estimated that the costs of decontaminating and decommissioning the plant may exceed $600,000,000. Br. *Amicus Curiae* of 24 Named States in Support of Respondents 6.

[28] *Id.*, at F-10 to 11, App. 587.

[29] Some of the experiences which led ultimately to the abandonment of the plant were discussed at length in the "Supplementary Comments of the Union of Concerned Scientists," App. 1108-1151.

[30] *Survey*, Chapter F, App. 580-609. *See* Natural Resources Defense Council v. N.R.C., 539 F.2d 824 (2d Cir. 1976), *cert. granted*, 45 U.S.L.W. 3647 (March 29, 1977), *quoting* the following from a letter to the Commission from the President's Council on Environmental Quality, as follows:

> "The potential impact of the diversion and illicit use of special nuclear materials are well recognized. This threat is so grave that it could determine the acceptability of plutonium recycle as a viable component of this Nation's nuclear electric power system. Thus. we believe that the NRC, the Executive Branch, the Congress, and the American people should have the benefit of a full discussion of the diversion and safeguards problem, its impacts, and potential mitigating measures, before any final decisions are made on plutonium recycle."

While it addressed the subject of accidents at a reprocessing facility, the Survey's conclusory discussion was confined to "credible" accidents.[31] No definition was provided of what kinds of accidents had been ruled out of consideration with the use of this conclusory term.[32]

Similarly, the Survey's discussion of the handling of highly radioactive (so-called "high level") wastes was confined to a few typed pages,[33] sketching in the most general outline desiderata for an "engineered storage facility" designed to provide "temporary" (100 year) storage for nuclear wastes pending the development of a means for "permanent" isolation of the wastes from all life.[34] Though the "intended life" of the engineered facility was a century, "the Federal government will have the obligation for care and maintenance as long as any waste is stored in the facility." [35] Even after the hoped-for development of a permanent repository for wastes, the Survey added, the federal government "will have the obligation to maintain control over the site in perpetuity." [36] The Survey provided no estimate of the economic resources that would be required by such perpetual surveillance. The Survey's discussion of the possibility of the release of radioactive materials to the environment

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[31] *Survey, supra*, App. 601-05.

[32] *Id.* Compare the treatment of fuel reprocessing provided in the fuel cycle proceeding with the one considered in *Natural Resources Defense Council* v. *NRC, supra.*

[33] *Id.*, Chapter G, App. 616-618, 619-624.

[34] *Id.*, G-10 to G-12, App. 617-18.

[35] *Id.*, G-11, App. 617.

[36] *Id.*

from the "engineered facility" was confined to the single conclusory sentence that: "The engineered facility for high level wastes will be designed to prevent any release of radioactive material either from natural phenomena or man-created accidents."[37] As to the remaining up-to-250,000 years of the wastes' toxicity, the reader was vouchsafed not even this degree of detail, as the Survey dismissed concern for it in the following two sentences:

> "It was planned to construct a federal repository in a salt mine for long-term geological storage of high-level wastes by the mid-1970's. However, subsequent events have deferred the site selection and construction of such a repository."[38]

4. ***Criticism of the Survey by Parties to the Rulemaking.***

Prior to the Hearing, the Environmental Protection Agency, the Sierra Club, respondent NRDC and others submitted detailed comments identifying specific defects in the analysis presented in the Survey.[39] Taken together, these detailed comments posed a basic challenge to the optimism of the Survey and the Commission's proposed rule.

The Sierra Club's comments stated clearly the gravamen of this challenge:

> "Many of the most important environmental risks and costs associated with the supporting fuel cycle for the nuclear power industry have been arbitrarily omitted from consideration or incompletely analyzed. Among the most prominent of these are plutonium

[37] *Id.*, G-3, App. 612.

[38] *Id.*, G-10, App. 617.

[39] Though part of the record below, these and other comments critical of the Commission's Survey were mistakenly omitted from the Appendix. For the Court's convenience, respondents have reproduced these materials in an Appendix to this Brief, A-1 to A-51.

> handling and recycling, long-term storage of high-level wastes and thermal pollution.
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> * * * *
>
> As a result of these shortcomings, the environmental costs of the fuel cycle are seriously underestimated in the Survey. Thus the conclusion, under consideration in the Commission's first alternative, that these costs are sufficiently small as not to affect the cost-benefit analysis for an LWR [light water reactor], is not tenable."[40]

NRDC's comments pointed to five major voids in the information provided by the Survey:

> 1. The Survey did not address the risks to human health and the environment resulting from extracting plutonium from spent fuel in reprocessing, including the risks of nuclear proliferation from successful diversion of extracted plutonium by foreign governments or terrorists.
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> 2. Though admitting that the Commission had not developed a means for permanent disposal of high level radioactive wastes, the Survey failed to provide information relevant to evaluating the probability that some means of disposal would be developed to assure the isolation of these materials from the environment for the unprecedented time periods necessary, such as the circumstances surrounding, and the reasons for, the Commission's lack of success in developing waste repositories in bedded salt deposits.
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> 3. The Survey failed to supply any details about the "near-surface engineered storage facility", making it difficult to accept the Commission's optimism regarding the possibility of storing wastes there for 100 years.
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> 4. The Survey did not address at all the environmental implications of "decommissioning" a nuclear

[40] Sierra Club, "Comments on Environmental Survey of the Nuclear Fuel Cycle." (January 24, 1973) A-8, 9.

power plant at the end of its forty year life—the problems of permanently restricting public access to the site, or attempting to dismantle and dispose safely of the massive structure of the facility.

5. Throughout the Survey, the Commission repeatedly eliminated analysis of "rare or low probability events" with potentially catastrophic consequences by labelling them "incredible," rather than attempting to quantify them. In particular, NRDC commented, the risk of successful sabotage of a waste disposal or reprocessing facility could not be dismissed as "incredible."[41]

In a letter sent prior to the hearing, the Environmental Protection Agency also identified critical gaps in the Survey. It stated that neither of the proposed rules were "acceptable without modification," suggesting that in view of the large unexplored areas in the Survey, either proposed rule was acceptable only if its applicability were limited to two years, while the Commission worked to provide an adequate analysis of the fuel cycle. In particular, the EPA suggested that the "disposition of high-level waste" was "one specific area that should be further examined." It also criticized the Survey for its failure to provide information about the probability of accidents, and the vagueness of the Survey's discussion of the proposed "interim" storage facility for high level radioactive wastes.[42]

During the hearing, each participant was permitted to make oral presentation to the Hearing Board but at no time were any of the participants permitted to cross-examine or request discovery of the regulatory staff

[41] "Comments of the Natural Resources Defense Council, Inc., on the Environmental Survey of the Nuclear Fuel Cycle," (January 26, 1973) A-1 to A-7.

[42] Comments of the U.S. Environmental Protection Agency (submitted by letter of January 19, 1973), A-24 to A-34.

on its Environmental Survey, the source of the facts utilized in preparing the Environmental Survey, the scientific and mathematical methodology utilized in deriving certain conclusions in the Survey, or the omission from the Survey of all alternatives to current AEC proposals for waste reprocessing and disposal. The questioning of the participants and the regulatory staff was conducted solely by the members of the Hearing Board, without the participants even being able to suggest questions.

5. ***Testimony of the Commission on Waste Disposal.***

To supplement the information provided in the Survey, the Commission offered two witnesses of its own. S. H. Smiley, Deputy Director for Fuels and Materials of the Commission's Directorate of Licensing, read a prepared statement summarizing the topics covered in the Survey. App. 757. Dr. Frank K. Pittman, Director of the Commission's Division of Waste Management and Transportation, presented a short statement regarding waste disposal. App. 776. His statement was devoted almost entirely to additional description of the environmental effects that the Commission projected from the normal operation of the temporary 100 year "engineered storage facility" for wastes envisioned in the Survey. Like the presentation in the Survey, Dr. Pittman's statement omitted reference to any actual experience relevant to assessing the possibility of constructing such a facility or the probability that the wastes could successfully be contained over such an extended period when constant human surveillance was required. While Dr. Pittman agreed that such a facility must be constructed to withstand all "credible" natural and manmade forces, he too offered no specification of what forces could be considered "credible." Similarly, although he opined that a permanent method of disposal for nuclear wastes would be demonstrated within a matter of 10 to 15 years, Dr. Pittman offered no information in support of this

position to add to the two sentence statement of the Survey. At the close of Dr. Pittman's statement, members of the Hearing Board put four questions to him.[43]

6. *Additional Concerns of the Parties and the Commission's Hearing Board.*

Although unable to propound questions to Dr. Pittman or Mr. Smiley, the Consolidated National Intervenors ("CNI") brought to the Commission's attention, through its counsel, Mr. Roisman, the omission of the critical questions identified in the pre-hearing submissions of NRDC and others that remained unaddressed in the statements of Mr. Smiley and Dr. Pittman and the questioning by the Board. App. 835-845.

Because of the limited ability of the participants to challenge the Environmental Survey, which was the sole document to be used as support for either of the two proposed alternatives, CNI and the Union of Concerned Scientists informed the Hearing Board that they intended to submit a comprehensive statement containing their comments and objections to the procedures used by the Commission and the insufficiency of the technical data contained in the Environmental Survey as issued by the regulatory staff. App. 844. Accordingly, they requested that a 30-day posthearing period be permitted for the filing of such a document. In a Further Notice of Hearing dated February 16, 1973, the Hearing Board declared that the oral hearing was to be regarded as concluded as of February 16, 1973, but that the record was to remain open until March 19, 1973, to permit the filing of any supplemental written statements which might be deemed appropriate in view of the hearing record. The Notice also allowed participants other than CNI and the Union of Concerned Scientists seven days within which

[43] The transcript of this questioning, and Dr. Pittman's answers, consumes but five pages in the Appendix. App. 830-35.

to review the supplemental filing and, if so, to request additional time therefor. Upon request, the Board granted several participants extensions of time until April 16, 1973, to respond to the supplementary comments. In its response the Commission's regulatory staff submitted a technical supplement entitled "Additional Information on Environmental Effects of the Uranium Fuel Cycle." App. 1058.

In the period following the hearing, additional detailed criticism of the analysis presented in the Environmental Survey and the testimony of the Commission's staff was submitted by a number of parties. On February 23, 1973, the Department of the Interior submitted a letter highly critical of the vagueness and generality of the information provided in the Survey. Noting that "The discussion of the effects [of the nuclear fuel cycle] on the environment are in most instances very general in this report," the Department suggested that "the November 1972 [Survey] should be significantly enlarged and modified if it is to fill the present need." In particular, the Department criticized the Survey for its failure "to describe the enormous potential for damage to the environment that is inherent . . . in the disposition of high-level radioactive wastes and purified plutonium," for its failure to consider the environmental effects of reprocessing spent fuel, and for its "assumption" that "chemical or radioactive wastes buried or held in retention ponds will not give rise to effluents and will not have environmental effects." "We do not," the letter added, "think that this assumption is generally acceptable."[44] Additional detailed critical comments were submitted by the Union of Concerned Scientists, App. 1067-1151, and jointly by the Union of Concerned Scientists/Consolidated National Intervenors, App. 1035-1057.

[44] Comments of the Department of Interior on the Environmental Survey of the Uranium Fuel Cycle (February 23, 1973), A-35 to A-42.

On July 6, 1973, the Hearing Board filed its "Report to the Commission by the Nuclear Fuel Cycle Hearing Board" setting forth its view of the issues that had been presented to the Hearing Board during the day and half of hearings. App. 364. In this report, the Hearing Board spotlighted the criticisms that had been raised by representatives of environmental/governmental critics concerning the inadequacy of the record to support the Commission's proposal to promulgate a rule regarding the environmental impact of the fuel cycle. It noted, *inter alia*, that

> "[T]he record of the hearing reveals that questions were raised as to the omission of any treatment in the Survey of the factors of safeguards against sabotage or possible diversion of nuclear materials, details of transportation, long-term environmental effects, selected aspects of mining and milling operations, details of various shipping operations, plutonium handling and others. A further example of alleged omissions from the Survey concerns the handling of plutonium isolated by the reprocessing plant which is also included in references to the omission of 'plutonium recycle' considerations."

App. 371. In light of these concerns, the Hearing Board asked

> "Whether, in light of the comments and questions raised in this record as to the present technical adequacy of the Survey, a substantial revision of the Environmental Survey should be prepared and issued by the Commission prior to the final adoption of regulations amending Part 20 of the Rules."

App. 372-3. It also asked

> "Whether more extensive analyses of the long-term environmental effects of, among others, waste storage and/or disposal are required to sustain the validity of the conclusions reached in the Survey."

App. 372.

7. The Commission Issues Its Rule.

On April 16, 1974, the Commission promulgated a rule concerning the treatment of the environmental effects of the uranium fuel cycle in proceedings to license nuclear reactors. App. 385. Adopting "Alternative 2" of the earlier proposal, it took the position that the environmenntal impact of the fuel cycle was "relatively insignificant." App. 394. It also instructed its licensing boards that Table S-3 should thenceforth be inserted in the record of any licensing proceeding and should constitute the entire consideration of the environmental effects of the fuel cycle in any such proceeding, with no further examination or inquiry to be allowed.[45] In answer to the Hearing Board's question of whether, in light of the omissions identified by intervenors in their comments and questions, the Commission should prepare a "substantial revision" of the Environmental Survey, the Commission stated simply that it

> "believes that the Survey and hearing record provide an adequate data base for the regulation adopted."

App. 392. More specific questions raised in the Hearing Board's report were brushed aside with equally conclusory statements.

B. The Decision of the Court of Appeals.

Respondents' challenge to the Commission's rulings in the rulemaking proceeding and the licensing of Vermont Yankee were heard and decided together by the U.S. Court of Appeals for the District of Columbia Circuit.

In examining the rulemaking proceeding, the court noted the narrow function to be discharged by a reviewing court. The court's function, it said, is not with the

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[45] 10 C.F.R. Part 51, § 51.20(e), App. 398.

wisdom of the decision, but rather with the rationality of the decision-making process. It must satisfy itself that the agency has addressed the major issues, and resolved them on the basis of all relevant factors. Under NEPA, the purpose of the Commission's rulemaking is to enlighten—to provide the public and other decisionmakers with information needed to assess whether a proposed action should be undertaken. To discharge this duty, the agency must give genuine consideration to the key issues, not just articulate its own view in conclusory terms. It must consider and acknowledge responsible scientific opinion in opposition to its own, and provide a reasoned explanation if it chooses to reject opposing views.

Turning to the record compiled by the Commission in its rulemaking, the court unanimously held that the Commission had failed to discharge these duties. Looking to the Survey, its backup documentation, and the testimony of Dr. Pittman in the hearing, it found that the agency had failed to give genuine consideration to the major issues concerning the environmental impact of waste disposal and the reprocessing of spent fuel.

Noting the extensive criticisms of the Survey submitted by the parties to the proceeding, the court held that the environmental parties had focused these issues sufficiently to require the Commission to come to grips with them. It also found, however, that the agency had failed in this duty, rejecting their contentions in a summary, unexplained manner.

In remanding the Commission's rulemaking, the court made clear that its complaint lay with the agency's failure to support its conclusion that the environmental effects of reprocessing and waste disposal were insignificant, rather than with the procedures followed, or the agency's explanation of its decision. While pointing to various procedures commonly used by agencies to produce an adequate record in fact-oriented rulemaking proceedings, the court noted pointedly that even the same procedures, if "administered in a more sensitive manner," might result in a record adequate to support a decision.

C. Events Since the Court's Decision: The President's Decision to Suspend Further Development of Plutonium Reprocessing.

Although the decision of the Court of Appeals held that the Commission had failed to give genuine consideration to some of the major public issues about the advisability of committing the Nation to a massive nuclear power industry, the Commission has continued to issue licenses for the construction and operation of nuclear plants with no more than a slight pause.

Immediately after the decision of the Court of Appeals, the Commission announced that it was temporarily suspending the further issuance of operating licenses or construction permits for nuclear power plants, in order to study the implications of the court's decision.[46] It also announced that it was reconvening the Licensing Board for Vermont Yankee, to determine whether the record in that proceeding should be reopened to take evidence on the issues involved in the court's decision.[47]

Exactly two months later, the Commission announced the commencement of a new rulemaking proceeding for the purpose of considering the adoption of an "interim" fuel cycle rule, to be used to license additional facilities pending a new proceeding to fashion a "final" fuel cycle rule.[48] This notice also announced that, pending the adoption of the "interim" rule, the Commission would

[46] 41 Fed. Reg. 34707 (August 16, 1976).

[47] *Id.*

[48] 41 Fed. Reg. 45849 (October 18, 1976).

resume licensing on the basis of a document containing a just-completed two-month staff analysis of the nuclear fuel cycle.[49] Subsequently the Commission promulgated its proposed "interim" rule, which is essentially the same as that overturned by the Court of Appeals.[50] Respondents have made it clear they regard these actions as contrary to the Court of Appeals' decision.[51] In the meantime, the Commission has undertaken a new generic rulemaking proceeding for the purpose of promulgating a replacement for the fuel cycle rule declared inadequate by the Court of Appeals.[52] The proposed final rule is identical to the interim rule, and thus differs little from the one disapproved in this case.

Shortly after the Commission announced the reconvening of the Licensing Board in Vermont Yankee, petitioners and the Commission sought and obtained a stay of the court's mandate.[53] In light of this action by the Court of Appeals, the Commission suspended its order reconvening the Licensing Board.[54] In sum, then, the Court of Appeals' decision has not had the dire consequences on the nuclear industry anticipated by petitioner Vermont Yankee in its petition for certiorari.[55]

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[49] 41 Fed. Reg. 49898 (Nov. 11, 1976).

[50] 42 Fed. Reg. 13803 (March 14, 1977).

[51] Comments of NRDC on Proposed Interim Fuel Cycle Rule (October 23, 1976); *NRDC* v. *N.R.C.*, Civ. No. 77-1448 (D.C. Cir.) (briefing stayed), filed May 13, 1977.

[52] 42 Fed. Reg. 26987 (May 26, 1977).

[53] Order of the Court of Appeals for the District of Columbia Circuit granting Vermont Yankee's *Motion for Stay Pending Application for a Writ of Certiorari*, October 8, 1976.

[54] *In re Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), CLI-76-18, NRCI 76-11470 (November 5, 1976).

[55] *See Petition of Vermont Yankee Nuclear Power Corporation for a Writ of Certiorari* (Sept. 21, 1976).

However, the policy of the federal government with respect to the nuclear fuel cycle has been drastically altered. On April 7, 1977, the President of the United States announced "a major change in the United States domestic nuclear energy policies":

> "First of all, we will defer indefinitely the commercial reprocessing and recycling of the plutonium produced in U.S. nuclear power programs.[56]

In announcing his decision, the President based it on precisely the concerns expressed by the critics of the Commission's treatment of plutonium reprocessing in its rulemaking:

> "Last year during the Presidential campaign, both I and President Ford called for strict controls over fuels to prevent the proliferation, and further proliferation, of nuclear explosive capability.
>
> * * * *
>
> "We have seen recently India evolve an explosive device derived from a peaceful nuclear power plant, and we now feel that several other nations are on the verge of becoming nuclear explosive powers.
>
> "The United States is deeply concerned about the consequences of the uncontrolled spread of this nuclear weapon capability. We have no authority over other countries. But we believe these risks would be vastly increased by the further spread of reprocessing capabilities of the spent nuclear fuel from which explosives can be derived." [57]

SUMMARY OFARGUMENT

In this case a federal agency has effectively ignored a substantial scientific controversy over an issue of major

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[56] "Remarks of the President on Nuclear Power Policy," the White House (April 7, 1977) (Reproduced at A-47 to A-51 of the Appendix to this Brief).

[57] *Id.*

technical and public significance. That issue involves potential threats to humanity and the environment for close to fifty times as long as recorded human history. The federal agency has chosen to avoid the issue on the basis of a supporting record consisting of testimony taken in a one and one-half day legislative-style hearing, a few general statements in a government document, and a one page table. The question is whether it may do so.

The legal issue posed is a simple one. The National Environmental Policy Act requires that a federal agency must prepare a detailed statement, assessing fully "any adverse environmental effects which cannot be avoided should the proposal be implemented." Section 102(2)(C)(ii), 42 U.S.C. § 4332(2)(C)(ii). After first denying any responsibility to consider the environmental effects of the waste products of nuclear power stations in connection with licensing them, the Nuclear Regulatory Commission reacted to the filing of this case by convening a rulemaking proceeding to seek comment on a single-page table, Table S-3, that was asserted to quantify all of the effects of the nuclear fule cycle.

In support of the facts alleged in Table S-3, the Commission offered a document, the Environmental Survey of the Nuclear Fuel Cycle, which discussed in conclusory terms the desiderata for a plant reprocessing spent fuel, and for a temporary (100 years) facility to store nuclear wastes pending the development of an as-yet undemonstrated means for isolating the wastes from the biosphere in perpetuity. After soliciting comment on its proposed rule, it held a one and one-half day hearing. At the hearing, the Commission presented two witnesses, one of whom addressed, in "vague, glowing" terms the Commission's "design concept" for the temporary waste storage facility. Neither discussed reprocessing of spent fuel. No discovery or cross-examination was allowed, despite the obvious significance of the issues under discussion, and despite the fact that the Commission ordinarily afforded such procedures for probing far less significant environmental issues in adjudicatory power plant licensing proceedings, and has also commonly used them in "hybrid" rulemaking proceedings concerned with both safety and environmental issues.

Though hobbled by the procedural restrictions of the rulemaking, the respondents, along with other environmental organizations, individuals, and government agencies, identified a number of important issues slighted or omitted in the Commission's presentation which they said resulted in a gross understatement of the environmental consequences of fuel reprocessing and disposal of atomic wastes from nuclear power stations. One of the omissions they cited was the Commission's failure to consider the dangers of nuclear proliferation flowing from reprocessing plutonium from spent fuel. Yet this danger was later cited by the President of the United States as the reason why he ordered the suspension of further work on reprocessing by the United States.

On the basis of the cursory record developed through this proceeding, the Commission promulgated its proposed rule, with only the most minor modifications. Stating that it regarded the environmental impact of the nuclear fuel cycle as "essentially insignificant," it ordered that in all future proceedings to license nuclear power stations, Table S-3 should constitute the only evaluation of the environmental impact of the fuel cycle to be considered.

The Court of Appeals for the District of Columbia held that on this record the Commission had failed to discharge its duty under NEPA to evaluate and disclose fully the environmental consequences of its proposed actions, and had brushed aside the reasonable concerns expressed by respondents and others rather than considering them carefully and explaining its reasons

for any it rejected. Such rulemaking practice, it held, did not meet the test of reasoned decisionmaking under NEPA and the Administrative Procedure Act. It also held that the Commission had erred in granting an operating license to Vermont Yankee without any consideration of the environmental impact of reprocessing and disposing of its spent fuel.

The respondents submit that these decisions of the Court of Appeals were an unexceptionable exercise of the normal supervisory function of the federal courts in reviewing administrative rulemaking.

ARGUMENT

I.

REJECTION OF THE FUEL CYCLE RULE WAS REQUIRED BY THE ADMINISTRATIVE PROCEDURE ACT AND THE NATIONAL ENVIRONMENTAL POLICY ACT.

In rejecting the Commission's proposed rule, the Court of Appeals exercised the most traditional reviewing powers of an appellate court overseeing the actions of an administrative agency. Examining the record of the Commission's rulemaking proceeding, the court found it riddled with vague, conclusory statements unsupported by reasoning or authority and outright omissions of obviously important issues, and marred by a refusal either to consider, or explain its failure to consider, such issues when they were brought to the agency's attention by other federal agencies, environmental organizations, and private citizens. Given the state of the record, the court had no choice but to hold that the Commission had failed to engage in the "reasoned decisionmaking" required of all administrative agencies. Judge Tamm, concurring, summarized the court's conclusion pungently.

> "I further agree with the conclusion of the majority that it is impossible to determine from the record before us whether the Commission has fulfilled its statutory obligation under NEPA in adopting the S-3 Table, or whether it has uncritically adopted as its own the undocumented conclusions of a single witness that the waste storage issue is a "non-problem" with which the Commission need hardly concern itself at this time. Accordingly, the inadequacy of the record demands that we remand this case to the Commission in order to ensure that it has taken a hard look at the waste storage issue."

App. 78-79.

Both the law of administrative procedure and the National Environmental Policy Act prohibit an agency from promulgating a rule on the basis of a record so flawed as the one in this case. The law of administrative procedure governs any agency rulemaking; NEPA applies here because of the purpose of this particular rulemaking. The rule promulgated by the Commission was not itself an Environmental Impact Statement, but it was to be a portion of the Environmental Impact Statement for every future nuclear power plant to be licensed. Indeed, the Commission stated explicitly that it was to constitute the *entire* assessment of the environmental impact of the fuel cycle in each plant's Environmental Impact Statement.[58] Thus the Commission's proposal could not be approved unless it was found to meet the requirements of NEPA.

A. The Law of Administrative Procedure Requires an Agency to Engage in Reasoned Decisionmaking.

Section 706(2)(A) of the Administrative Procedure Act, 5 U.S.C. § 706(2)(A), requires a reviewing court to set aside any action of an administrative agency that it finds to be ". . . arbitrary, capricious, and abuse of dis-

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[58] 10 C.F.R. Part 51, § 51.20(e), App. 398.

cretion . . . ." In decisions stretching over more than thirty years, this Court has held that this language requires rejection of administrative action that does not meet the standard of reasoned decisionmaking.

This Court has held that to determine whether this standard has been met, a reviewing court must examine the record and "consider whether the decision was based on a consideration of the relevant factors," *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402, 416. Unless the record provides an "indication of the basis on which the agency exercised its expert discretion," *Burlington Truck Lines, Inc.* v. *U.S.*, 371 U.S. 156, 167, the agency's action cannot be sustained. *See also, S.E.C.* v. *Chenery*, 318 U.S. 80 (1943); *Camp* v. *Pitts*, 411 U.S. 138 (1973). Similarly, the agency must "articulate a rational connection between the facts found and the choice made." *Burlington Truck Lines, supra*, at 196.

In applying these principles, the lower federal courts have amplified their meaning in the context of rulemaking and adjudication alike. The duty to compile an adequate record includes an affirmative obligation to seek out relevant information, not merely to "act as an umpire blandly calling balls and strikes." *Scenic Hudson Preservation Conference* v. *F.P.C.*, 354 F.2d 608 (2d Cir. 1965), cert. denied, 384 U.S. 941; *Isbrantsen Co.* v. *U.S.*, 96 F.Supp. 883, 892 (S.D.N.Y. 1951). If a party calls its attention to an issue of importance, the agency's duty is to investigate—"when the issue fairly clamors for attention, even a gentle reminder speaks loud enough for the agency discharging its duty." *Marine Space Enclosures, Inc.* v. *F.M.C.*, 420 F.2d 580 (D.C. Cir. 1969). The duty is the greater when a citizens organization, with limited resources, identifies the issue. *Office of Communications of United Church of Christ* v. *F.C.C.*, 359 F.2d 994 (D.C. Cir. 1966).

To assure the reasoned decisionmaking required by the Administrative Procedure Act, the courts have increasingly found it necessary to scrutinize carefully the record in administrative rulemaking, especially where questions of scientific and technical fact are crucial, as they are so often in environmental matters.

> A court does not depart from its proper functions when it undertakes a study of record, hopefully perceptive even as to the evidence on technical and specialized matters, for this enables the court to penetrate to the underlying decisions of the agency, to satisfy itself that the agency has exercised a reasoned discretion, with reasons that do not deviate from or ignore the ascertainable legislative intent.

International Harvester Co. v. *Ruckelshaus*, 478 F.2d 615, 648 (D.C. Cir. 1973), quoting *Greater Boston TV* v. *F.C.C.*, 444 F.2d 841, 850 (D.C. Cir. 1971), cert. denied, 403 U.S. 923, rehearing denied, 404 U.S. 877.

> "[T]he necessity to review agency decisions, if it is to be more than a meaningless exercise, requires enough steeping in technical matters to determine whether the agency 'has exercised a reasoned discretion.'"

Portland Cement Association v. *Ruckelshaus*, 486 F.2d 375 (D.C. Cir. 1973) (Leventhal, J.) cert. denied, 417 U.S. 921, rehearing denied, 423 U.S. 1025.

Thus the courts have, after searching examination of the record, set aside orders requiring new automobiles to be equipped with catalytic mufflers for the control of pollution, *International Harvester, supra*, on the grounds that the Administrator of the Environmental Protection Agency had failed to compile a record sufficient to demonstrate the availability of the technology within the time period allowed; regulations requiring new Portland cement factories to be equipped with stringent air pollution control equipment, *Portland Cement Association* v.

Ruckelshaus, supra, because the EPA Administrator had insufficiently addressed the issue of how much the technology would cost; regulations setting standards for discharges of water pollutants from chemical plants, *Hooker Chemical Co.* v. *Train*, 537 F.2d 639 (2d Cir. 1976), because they failed to consider the effects of cold weather on the technology to be used; and regulations prescribing measures for the control of automobile traffic to reduce air pollution caused by automobiles in Houston, *Texas* v. *EPA*, 499 F.2d 289 (5th Cir. 1974), and Boston, *South Terminal Co.* v. *EPA*, 504 F.2d 646 (1st Cir. 1974). As the Tenth Circuit recently held, reviewing an environmental regulation promulgated by informal rulemaking, "The grounds upon which an agency bases its decision must be clearly disclosed in, and sustained by, the record. The agency must make plain its course of inquiry, its analysis and its reasoning." *American Petroleum Institute* v. *EPA*, 540 F.2d 1023, 1029 (10th Cir. 1976).

B. The National Environmental Policy Act Requires an Agency to Investigate Thoroughly and Disclose Fully the Environmental Consequences of Its Proposed Activities.

Under the National Environmental Policy Act, 42 U.S.C. §§ 4331 *et seq.*, any federal agency contemplating a major federal action which may affect the environment must prepare and make public a "detailed statement" analyzing the environmental impact of the proposed action. The Act is intended to be "action-forcing"[59]: to influence federal administrators to seek ways to lessen or eliminate the adverse effects on the environment from proposed projects or courses of action, Section 101(b), 42 U.S.C. § 4331(b). The Congress chose to require disclosure as the primary means to accomplish this pur-

[59] U.S. SEN. COMM. ON INTERIOR & INSULAR AFFAIRS, NATIONAL ENVIRONMENTAL POLICY ACT OF 1969. S. REP. No. 91-296, 91st Cong., 1st Sess. (1969).

pose. Section 102(2)(C), 42 U.S.C. § 4332(2)(C). Thus it required that each Environmental Impact Statement must analyze in detail

> "(i) the environmental impact of the proposed action,
>
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> (iii) alternatives to the proposed action,
>
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
>
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action if implemented."

Id.

Requiring an agency to prepare an Environmental Impact Statement is designed to encourage more environmentally responsible agency behavior in two ways. First, it forces the agency to inform itself so that it acts "only following complete awareness . . . of the environmental consequences." *National Helium Corp.* v. *Morton*, 455 F.2d 650, 656 (10th Cir. 1971). And second, it provides the public, other agencies, the Congress and the courts with the information they need to exert their influence on the agency preparing the statement towards environmentally less damaging policies. Thus NEPA also "serves as an environmental full disclosure law, providing the information Congress thought the public should have concerning the particular environmental costs involved in the project." *Silva* v. *Lynn*, 482 F.2d 1282, 1285 (1st Cir. 1973); *Natural Resources Defense Council* v. *S.E.C.*, —— F.Supp. ——, 10 ERC 1026 (D.C.D.C. May 19, 1977), appeal pending. *See also, EDF* v. *Corps of Engineers*, 325 F.Supp. 749 (E.D. Ark. 1971), affirmed, 470 F.2d 289 (8th Cir. 1972).

In order to effectuate these purposes, this Court has stated that in reviewing the adequacy of an Environmental Impact Statement, the "role for a court is to insure the agency has taken a 'hard look' at the environmental consequences." *Kleppe* v. *Sierra Club*, 427 U.S. 390 (1976), 410 n. 21, citing *Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 838 (D.C. Cir. 1972) (Leventhal, J.); *New York* v. *Kleppe*, 429 U.S. 1307, 1310-11 (1977) (circuit opinion of Justice Marshall, J.).

In order to insure that the agency has sought to inform itself fully, the courts look to the statement itself and its supporting materials for "an informed and adequately explained judgment," *Silva* v. *Lynn*, *supra*, at 1287, reflecting a "good faith effort to take into account the values NEPA seeks to safeguard." *Id.* at 1284. In preparing an Environmental Impact Statement the agency must "assemble the necessary information, perceive and weigh the alternatives, and articulate in writing the reasons for the choices made." *Brooks* v. *Volpe*, 350 F.Supp. 259, 274 (W.D. Wash. 1972). Thus NEPA "places a heavy burden on [the agency]. To enable a court to ascertain whether there has been genuine, not perfunctory, compliance with NEPA, the [agency] will be required to explicate fully its course of inquiry, its analysis, and its reasoning." *Ely* v. *Velde*, 451 F.2d 1130, 1139 (4th Cir. 1971).

If the agency fails to provide or explain the information supporting its conclusions, neither a reviewing court nor other decisionmakers can evaluate the proposed action as intended by Congress. A statement that is "too vague, too general and too conclusory", *Environmental Defense Fund* v. *Froehlke*, 473 F.2d 346, 348 (8th Cir. 1972), cannot be approved, nor can one "unsupported by empirical or experimental data, scientific authority, or explanatory information," *Natural Resources Defense Council* v. *Grant*, 355 F. Supp. 280, 287 (E.D.N.C.

1973). Where technical issues are at stake, the agency may not resolve them simply by reference to its expertise, for "uncertainty must attend a court's approval of a statement based on an unknown 'record of expert views and opinions, the technological data and other relevant material . . .' on which the [agency] acted . . .", *Silva* v. *Lynn*, *supra*, at 1284, citing *Appalachian Power Co.* v. *E.P.A.*, 477 F.2d 485, 507 (4th Cir. 1973).

To further insure that an agency's proposed actions are exposed to the views of those who do not have a stake in the proposal, NEPA provides that the initiating agency shall "consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved," as well as others concerned with environmental standards. Section 102(2)(C) of NEPA, 42 U.S.C. § 4332(2)(C). This requirement is not merely formal, mandating "no more than the physical act of passing certain folders and papers, unopened to reviewing officials," as one court described the Commission's position in its earliest NEPA case, *Calvert Cliffs Coordinating Comm.* v. *Atomic Energy Commission*, 449 F.2d 1109, 1117 (D.C. Cir. 1971), cert. denied, 404 U.S. 942. Rather, the agency must take responsible criticism fully into account:

> "[W]here comments from responsible experts or sister agencies disclose new or conflicting data or opinions that cause concern that the agency may not have fully evaluated the project and its alternatives, these comments may not simply be ignored. There must be good faith, reasoned analysis in response."

Silva v. *Lynn*, *supra*, at 1285. *See also*, *Committee to Stop Route 7* v. *Volpe*, 503 F.2d 601 (2d Cir. 1973), *Committee for Nuclear Responsibility* v. *Seaborg*, 413 F. 2d 783 (D.C. Cir. 1972); *Akers* v. *Resor*, 339 F.Supp. 1375 (D.C.W.D. Tenn. 1972); *Simmans* v. *Grant*, 370 F.Supp. 5 (D.C.S.D. Tex. 1974).

C. The Court of Appeals Correctly Held that the Commission Had Not Engaged in Reasoned Decision-making.

The decision below rests squarely on the court's entirely correct finding that the Commission failed to take the "good, hard look at the major issues" concerning the environmental hazards of the reprocessing and disposal of irradiated fuel from nuclear reactors. App. 46. This conclusion was surpassingly obvious. The Commission devoted only one and one-half days to hearings investigating the potential impact of these steps of the nuclear fuel cycle, even though they pose perhaps the major environmental questions about generating power from nuclear fission. In support of its assertion that the environmental effects of these steps in the fuel cycle were "relatively insignificant," it adduced only a few conclusory pages on each topic in its Environmental Survey, and the "vague, glowing" testimony on waste disposal of a single witness from its own staff.[60] Given the parlous state of the record, it is obvious why none of the petitioners disputes the court's conclusion.

The court's opinion traces carefully through the parsimonious offerings of the Commission, identifying clearly the failure to give any genuine consideration to the major issues involved. App. 50-66. Seeking support for the Commission's assertions, the court consulted the three

[60] By contrast, major studies on the environmental impacts of reprocessing and waste disposal are now being undertaken by the Department of Energy, "Draft Generic Environmental Impact Statement, Management of Commercially-Generated Radioactive Wastes," and the Nuclear Regulatory Commission, GESMO, *supra*. These studies are all multi-year studies, whose depth and breadth dwarf the meager *Survey*. The procedures being used to develop the records far exceed those provided in the rulemaking involved here (*see* 41 Fed. Reg. 1133 (January 6, 1976) (GESMO); 41 Fed. Reg. 43446 (October 1, 1976) ("Management," *supra*)). The Commission continues to ignore these studies in its licensing proceedings for nuclear reactors.

sources offered by the Commission: "the Environmental Survey, the back-up documentation to which it refers, and the oral and written testimony offered at the hearing." App. 51.

While noting that the Environmental Survey provided adequate information to support the Commission's conclusions for most aspects of the fuel cycle, this contrasted dramatically with the treatment of fuel reprocessing and waste disposal, where "support for the staff's conclusions was noticeably absent." App. 52. Turning to the hearing record, the court found that the Commission had supplemented the Survey's information about waste disposal with a 20-page statement by Dr. Pittman, which as the court said, "for the first time in public the 'design concepts' for a federal surface repository for retrievable storage of high-level waste"—essentially a warehouse in which sealed canisters containing cylinders of solidified nuclear wastes can be stored in water-filled basins recessed into the ground on a temporary basis (up to 100 years) until such time as a permanent waste disposal scheme is devised . . . ." App. 52-3. It went on to describe the vague and unsupported outline of this plan "now also postponed indefinitely," as it stated, App. 55, given by Dr. Pittman, pointing out his failure to discuss how the facility would be protected from terrorism, what measures might be taken to prevent a "meltdown," or how the Commission could assure that "adequate human surveillance and maintenance" could be assured over a period of a century. App. 60.

As to the ultimate disposition of these high-level wastes over the 250,000 year period of their toxicity, Dr. Pittman added no new information to supplement the two sentences devoted to this topic in the Survey. While he expressed optimism that the Commission would perfect means of indefinitely isolating wastes from the human environment by placing them in bedded salt, he said noth-

ing whatever to explain why, when the Commission had failed to demonstrate this method over a period of some 15 years, he expected such a drastic reversal of its fortunes.

Likewise, neither he nor the Commission's other witness, Mr. Smiley, uttered a single additional word to supplement the few conclusory sentences in the Environmental Survey concerning the environmental hazards of fuel reprocessing.

The court also found that when issues were raised before the Commission, it failed to take them seriously or explain why it had rejected them. Thus the court pointed to the fact that various of the intervenors had criticized the Commission for its reliance on discussions of what reprocessing and disposal facilities would have to do ("design concepts"), rather than actual information even where experience was available; that they had questioned the Commission's confidence that measures such as "engineered surface storage," relying on stable human institutions for a century or more, could protect the public adequately; and that they had expressed reasonable doubts that, after years of failure, the Commission would be able to develop a means for indefinite isolation of nuclear wastes. App. 62-4. It might also have mentioned the detailed critique of the Survey submitted in writing by NRDC and the Sierra Club, and the conclusions of both the Environmental Protection Agency and the Department of the Interior, in their written comments, that the information presented was inadequate to support the conclusions drawn in the Survey. *See* 14-16, 18-19, *supra*, and A-24 to A-42.

If this were not enough, the Commission's Hearing Board, as we have indicated previously, *see* 19, *supra*, App. 63-4, alerted the Commission to them in its Report on the rulemaking proceeding. But the Commission's only

response was a few conclusory remarks in the notice accompanying its adoption of the rule. App. 364-5.

Summarizing its conclusion, the court found the Commission's conclusions unsupported in the record:

> "In substantial part, the materials uncritically relied on by the Commission in promulgating this rule consisted of extremely vague assurances by agency personnel that problems as yet unsolved will be solved. That is an insufficient record to sustain a rule limiting consideration of the environmental effects of nuclear waste disposal to the numerical values of Table S-3 . . . Not only were the generalities relied on in this case not subject to rigorous probing—in any form—but when apparently substantial criticisms were brought to the Commission's attention, it simply ignored them, or brushed them aside without answer. Without a thorough exploration of the problems involved in waste disposal, including past mistakes, and a forthright assessment of the uncertainties and differences in expert opinion, this type of agency action cannot pass muster as reasoned decisionmaking."

App. 66. There can be no question that this conclusion is correct.

Indeed, only one of the petitioners makes even a gesture toward contesting the court's conclusion. Petitioner Baltimore Gas & Electric urges that the court treated "cavalierly" the portion of the rulemaking record on reprocessing, because the court's opinion concentrates on explicating the record with respect to waste disposal. The petitioner urges that the record contains extensive materials related to the fuel cycle. Baltimore Gas and Electric Br. at 20. The fact is that the major document among those cited by the petitioners was the detailed attack on the vague assurances of the Survey in the Supplementary Comments of the Union of Concerned Scientists, App.

1067, 1108-1150, which was supported by the earlier comments of respondent, the Sierra Club, the Environmental Protection Agency, the Department of the Interior, and others. And the critical point is that the Commission *did not* base its conclusions on the items petitioners refers to: indeed, the Commission gave *no* indication of the basis for the asserted insignificance of the environmental hazards of reprocessing, except to refer to the vague generalities of the Survey. App. 391.

II.

THE COURT OF APPEALS DID NOT DIRECT THE COMMISSION TO ADOPT ADDITIONAL PROCEDURES, ALTHOUGH IN CASES SUCH AS THIS, A COURT MAY REQUIRE ADDITIONAL PROCEDURES TO ASSURE THE DEVELOPMENT OF AN ADEQUATE RECORD.

Unable to assail the court's conclusion as to the record, the petitioners turn their fire on a straw man. They urge that the court required the Commission to adopt procedures beyond the minimum required by the Administrative Procedure Act for rulemaking, then seek to demonstrate that this was beyond the court's power. Vermont Yankee Br. at 30-38; Baltimore Gas and Electric Br. at 22-34; Government Br. at 38-46.

The government's attempt to pursue this issue is particularly curious. In its present brief it states that:

> "It is open to dispute whether the decision of the court of appeals in *Vermont Yankee* is based on the conclusion that the Commission's rulemaking *procedures* were inadequate, or whether it simply concluded that the *record* upon which the Commission relied in promulgating its rule was inadequate." [emphasis in original]

Government's Br. at 36. It agrees that if the latter interpretation is correct, "no significant question for review by the Court would be presented," *Id.*, but then proceeds to a long attack on the decision as if the decision were based on deficiencies in the Commission's procedure.

In its response to the petition for certiorari in this case, however, the United States took a far less equivocal view:

> "The United States *believes* that the court in *Vermont Yankee* held unanimously that the record in the particular rulemaking proceeding at issue was inadequate to support the rule promulgated." [emphasis supplied]

Government's Br. in reply to the Petitions for *Certiorari* in Nos. 76-419, 76-528, 76-548, and 76-745 at 9. Only the Nuclear Regulatory Commission argued that the Court of Appeals' decision involved whether the Commission had used proper procedure in the rulemaking, *Id.*, at 5-9. Thus the position now urged by the Solicitor General is in fact espoused only by the Commission itself.

For the Commission to advocate this position is disingenuous in the extreme. In the administrative proceedings responding to the Court of Appeals' decision,[61] the Commission has consistently argued that the court's decision was based entirely on the deficiencies it found in the record, steadfastly denying NRDC's requests for additional procedures to aid in the development of a new record regarding the environmental effects of waste reprocessing and disposal.

> "[T]he court found that the rule was inadequately supported in the record insofar as it treated two particular aspects of the fuel cycle—the impacts from reprocessing of spent fuel and the impacts from radioactive waste management [disposal].

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[61] *See* 22-24, *supra*.

41 *Fed. Reg.* 45849 (October 18, 1976) (announcing the Commission's intention to undertake licensing of reactors pending the promulgation of an "interim" fuel cycle rule). More recently, opening a rulemaking to develop a new rule to supplant the one overturned by the Court of Appeals, the Commission stated:

> "The original procedures proved adequate for the development and illumination of a wide range of fuel cycle impact issues . . . . True, the record was held inadequate on the two matters at issue here, but these issues are of the same character as the other issues regarding which the record did prove adequate . . . .
>
> . . . The court here indicated that the procedures previously employed would suffice, and indeed did for other issues . . . .
>
> * * * *
>
> Accordingly, notice is hereby given that the rules for the conduct of the reopened hearing and the authorities and responsibilities of the Hearing Board will be the same as originally applied in this matter (38 Fed. Reg. 49, January 3, 1973) except that specific provision is hereby made for the Hearing Board to entertain suggestions from participants as to questions which the Board should ask of witnesses for other participants."

42 *Fed. Reg.* 26987, at 26988-89 (May 26, 1977).[62]

The positions of the petitioners vary somewhat, but they sound a like theme. All three accuse the court below of attempting to require the Commission to adopt procedures in excess of the minima specified for informal rulemaking under the Administrative Procedure Act. Petitioner Vermont Yankee then expounds the expansive theory that in reviewing an administrative rulemaking,

[62] Reprinted in Supplemental Appendix to the Petition for Certiorari in No. 76-419 at SA-20 to 24.

a court may never require an agency to adopt any additional procedures beyond the minimum notice and comment specified in 5 U.S.C. § 553. Vermont Yankee Br. 35. Petitioner Baltimore Gas & Electric and the government, though somewhat less expansive, propose to lay a heavy burden on those who seek greater opportunity to make their views known. Baltimore Gas & Electric Br. 28, Government's Br. 46.

A. The Court of Appeals Did Not Direct the Commission to Provide Any Additional Procedures.

The short answer to all these arguments is that the court below did not rule as alleged by the petitioners. At the outset of its analysis of the record, the court stated its view that

> "Absent extraordinary circumstances, it is not proper for a reviewing court to prescribe the procedural format which an agency must use to explore a given set of issues."

App. 45. And in announcing its conclusion, the court stated flatly:

> "We do not presume to intrude on the agency's province by dictating to it which, if any of these devices it must adopt to flesh out the record. It may be that no combination of the procedures mentioned above will prove adequate . . . . On the other hand, the procedures the agency adopted in this case, if administered in a more sensitive, deliberate manner, might suffice."

App. 67.

More telling, the court explicitly ruled against the contention of the intervenors that they were entitled to discovery and cross-examination of witnesses in the rulemaking proceeding. App. 43-45. *See* Brief of Natural Resources Defense Council and Consolidated National Intervenors in the rulemaking case below (No. 74-1586 before the Court of Appeals), at 11-21.

It is true that the court spoke of the procedures the Commission used. But petitioners mislead this Court in suggesting that an abstract concern for procedure formed the basis for the court's decision. To the contrary, the court's concern with the procedures used was with their failure to produce any "rigorous probing" of the issues before the agency. App. 66. It was concerned with whether the procedures chosen, and the spirit in which they were administered, had provided an opportunity for the kind of give and take between the Commission and its critics ("ventilation") that would assure the Commission had come to grips with the fundamental differences of opinion and resolved them in a reasoned way. Concern for reasoned governmental behavior, not for procedure, motivates a court that bases its decision on, *inter alia*, the fact that "when apparently substantial criticisms were brought to the Commission's attention, it simply ignored them or brushed them aside without answer." App. 66.

B. Neither NEPA Nor the Administrative Procedure Act Provides Administrative Agencies Untrammelled Discretion To Constrict Their Rulemaking Procedures.

Despite the fact that the issue is not presented in this case, the petitioners urge this Court to rule to restrict drastically the Courts of Appeals' authority to oversee the actions of administrative agencies. The sum and substance of the petitioners' position is that, even if the purpose of an administrative proceeding is to develop and explicate a wholly factual question in order to discharge the duty to inform the public and other decisionmakers imposed by NEPA, the Administrative Procedure Act provides the agency essentially unreviewable discretion to restrict the procedures used to illuminate the questions to the minimum notice and comment. Though this legal question is not presented in this case, the petitioners' contention is flatly incorrect as a matter of law.

1. *Agencies May be Required By NEPA to Provide Procedures Beyond The Minima Specified in 5 U.S.C. § 553 When Investigating Factual Issues Through Rulemaking.*

As the court pointed out, App. 48, the Commission's rulemaking was undertaken in the context of NEPA, not just the Administrative Procedure Act. NEPA's central purpose is the development and dissemination of factual information "to the fullest extent possible" Section 102, 42 U.S.C. § 4332; *Flint Ridge Development Corp.* v. *Scenic Rivers Association*, 96 S.Ct. 2430, (1976); *Silva* v. *Lynn, supra; Environmental Defense Fund* v. *Corps of Engineers, supra.* To this end, the courts have correctly held, that an agency's discretion to limit its investigation is tightly confined. *E.g., Hanly* v. *Mitchell*, 460 F.2d 640 (2d Cir. 1972), cert. denied *sub nom. Hanly* v. *Kleindienst*, 409 U.S. 990; *Flint Ridge Development Corp.* v. *Scenic Rivers Association, supra, NRDC* v. *Morton, supra; Scientists' Institute for Public Information* v. *A.E.C.*, 481 F.2d 1079, 1088 (D.C. Cir. 1973).[63] In the words of one commentator, "there is no question that NEPA accentuates the Overton Park tendency to require a 'hard look' by the courts at agency actions affecting the environment."[64] By contrast, the purpose of the Administrative Procedure Act is narrower

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[63] The entire contribution of the Commission's rulemaking here to the Environmental Impact Statements for future nuclear power plants was a one-page table of figures, "Table S-3," purporting to quantify the environmental effects of the nuclear fuel cycle. Promulgation of the Final rule respecting the "Environmental Effects of the Nuclear Fuel Cycle," 39 Fed. Reg. 14188 (April 22, 1974), App. 385, 400, accompanied by two paragraphs specifying that Table S-3 was to be included in the Environmental Impact Statement for any future nuclear power plant, and was to constitute the entire consideration given the fuel cycle in any such Statement, 10 C.F.R. § 51.20(e), App. 398.

[64] RODGERS, ENVIRONMENTAL LAW, West Hornbook Series 716-17 (1977), citing Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U.PA. L. REV. 509, 512 (1975).

—to assure that the Agency's action lies within the broad range of discretion granted by Congress. *U.S.* v. *Allegheny Ludlum Steel Corp.*, 406 U.S. 742 (1972); *U.S.* v. *Florida East Coast Railway Co.*, 410 U.S. 224 (1973).

Thus, petitioner Baltimore Gas & Electric is wrong on the law as well as the facts when it suggests that the environmental organizations failed to make a "showing of substantial justification" of the need for cross-examination and discovery in the rulemaking proceeding. Baltimore Gas & Electric Br. at 28-34. Putting aside whether the petitioner has accurately stated the law under the Administrative Procedure Act,[65] it is by no means self-evident that any such showing is necessary in an essentially fact-finding proceeding under NEPA.[66]

2. *The Administrative Procedure Act Requires More Than the Minimum Procedures Specified in 5 U.S.C. § 553, Where As Here, the Agency Has Routinely Provided Such Procedures in the Past.*

Agencies are not free to alter their procedures on a whim, grossly constricting parties' procedural rights when it deems them an impediment or embarrassment to implementing its own views. The government con-

[65] The court below explicitly held that the environmental organizations had adequately alerted the Commission of their concerns under the standards of the Administrative Procedure Act over the same claim by Baltimore Gas & Electric, App. 44. Citing specific references in the record, it held that the environmental organizations had "sufficiently focus[ed] the agency's attention on Dr. Pittman's testimony as in the category of 'soft and sensitive subjects and witnesses,'" *citing International Harvester* v. *Ruckelshaus, supra.* In addition to the materials cited by the court, as noted previously, comments including specific criticisms of the Commission's positions on reprocessing and waste disposal were submitted prior to the hearing by NRDC, the Sierra Club, and the Environmental Protection Agency, and after the hearing by the Department of the Interior and the Union of Concerned Scientists. *See* cases discussed at 30, *supra.*

[66] Leventhal, *supra.*

cedes that Constitutional due process may require a court to specify additional procedures beyond the minima prescribed by the Administrative Procedure Act where there are

> "unjustified departures from settled agency practice, such as an agency's refusal to employ for a particular rulemaking more extensive procedures that the agency has routinely afforded."

Government's Br. at 47. *See Marine Space Enclosures* v. *F.M.C., supra; see also* dissent of *Burger, J.*, in *American Airlines* v. *C.A.B.*, 359 F.2d 624 (D.C. Cir. 1966). Though the government refuses to recognize it,[67] this is precisely the situation in this case.

Under the Commission's regulations, 10 C.F.R. § 51.20 (e), an Environmental Impact Statement for any nuclear power plant is subject to the same adjudicatory hearing afforded for any issue respecting the construction or operation of the plant. These regulations provide that any intervenor in a licensing proceeding shall be afforded the full panoply of adjudicatory rights under Sections 7 and 8 of the Administrative Procedure Act, 5 U.S.C. §§ 556-7.

Pursuant to the ruling by the Commission at the behest of NRDC, certain of the generic environmental issues related to the nuclear fuel cycle were required to be considered in the Vermont Yankee licensing proceeding. *In the Matter of Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station), ALAB-56*, App. 112, 115. However, consideration of the environmental impact of reprocessing spent fuel and waste disposal were removed from the normal process to

[67] The government erroneously alleges, without reference to the record or other Commission proceeding, that "the Commission's manner of proceeding was consistent with its previous practice." Government's Br. at 47.

be considered only in the far less searching manner afforded in the Commission's rulemaking proceeding.[68]

Thus, the Commission singled out these issues, widely regarded as the most important and problematical ones related to nuclear power, for treatment under a procedure markedly less likely to result in "rigorous probing" than the procedures normally used to investigate environmental and nuclear safety questions, allowing the Commission to avoid confronting the criticisms of the environmental organizations and resolve them in a reasoned manner. The stated reason for this restriction, the generic nature of the issues surrounding the fuel cycle, 37 Fed. Reg. 24191, 24192 (November 15, 1972) App. 352, 355, was suspect on its face, for the Commission had already ruled that such equally "generic issues as the transportation of high and low level wastes from Vermont Yankee were to continue to be addressed in the normal adjudicatory fashion."

It is certainly true that the Commission has in the past chosen to consider both environmental and safety issues that would ordinarily be addressed in adjudicatory licensing proceedings through "generic" rulemaking, a practice with which the lower court did not take issue. But in those proceedings the Commission has provided for far greater participation by parties through procedures well in excess of those provided here, including in some instances the cross-examination which was denied

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[68] In promulgating its fuel cycle rule, the Commission ruled that once Table S-3 was inserted into the Environmental Impact Statement for a specific power plant, no further examination of the fuel cycle issues addressed there would be allowed in the licensing proceeding. 39 Fed. Reg. 14188 (April 22, 1974), amending 10 C.F.R. Part 50, Appendix D, App. 385, 398.

the environmental organizations in the fuel cycle rulemaking.[69]

3. *A Court May Require More Than the Minimum Procedures of 5 U.S.C. § 553 When an Agency's Proposed Rule Addresses Complex or Technical Factual Issues, or Issues of Great Public Import.*

Even where agencies have not departed from prior practices, a reviewing court is not so powerless to oversee their procedures under the Administrative Procedure Act as the petitioners suggest. In their briefs, they take the extreme positions that the agency's discretion to limit participants to notice and comment procedures is unreviewable, Vermont Yankee Br. at 35, or reviewable only in "extraordinary circumstances," Government's Br. at 47, or upon a showing of "substantial justification," Baltimore Gas & Electric Br. at 28. With these assertions, they ask this Court to ignore the intent of the drafters of the Administrative Procedure Act, and to repudiate on the most significant and widely hailed developments in the law of administrative procedures—the development of what has been called "hybrid rulemaking."

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[69] For example, the Commission has allowed parties to undertake cross-examination in rulemaking proceedings regarding the "Emergency Core Cooling Systems" of nuclear power plants, 37 Fed. Reg. 2881 (Jan. 8, 1972); whether the Commission's regulations required emissions of radioactive effluents from the normal operation of nuclear power plants to be "As Low As Practicable," 37 Fed. Reg. 287 (Jan. 8, 1972), and provided opportunity for cross-examination in preparation of a "Generic Environmental Statement for the Mixed Oxide Fuel Cycle" ("GESMO") (reprocessing of spent fuel), 41 Fed. Reg. 1133 (Jan. 6, 1976). Perhaps the most telling, in the Commission's rulemaking pursuant to the remand of this case, undertaken to compile a new record concerning waste disposal and reprocessing, the Commission has provided for procedures not accorded in the original fuel cycle rulemaking under review here. 42 Fed. Reg. 26987, 26988-89 (May 26, 1977), *see* 22-24, *supra*.

The government recognizes,[70] though it fails to comprehend,[71] that the framers of the Administrative Procedure Act intended that notice and comment procedures would constitute the *minimum* procedures that should accompany agency rulemaking. The Senate Report[72] on Section 4(b) of the Administrative Procedure Act (now 5 U.S.C. § 553(c)) makes this point clearly:

> "This subsection states . . . the minimum requirements of public rulemaking procedure short of statutory hearing. Under it agencies might in addition confer with industry advisory committees, consult organizations, hold informal "hearings," and the like . . . . *Matters of great import, or those where the public submission of facts will be either useful to the agency or a protection to the public, should naturally be accorded more elaborate public procedures.*" [emphasis supplied]

Senate Report, *supra*, at 14-15.

The import of this statement has been increasingly recognized in recent years, as administrative agencies have been delegated the duty to undertake rulemaking in complicated technical matters of great import to society. While courts have upheld simple notice and comment rulemaking to resolve such relatively technically simple policy issues as safety standards for lighting boat trailers, *Boating Industry Association* v. *Boyd*, 409 F.2d 408 (7th Cir. 1969), and the mandatory retirement age for pilots, *O'Donnell* v. *Shaffer*, 491 F.2d 59 (D.C. Cir. 1974), they have increasingly hesitated to endorse such simple procedures when issues of major import are at stake, especially if they find that the issues involved have been inadequately explored, *e.g.*, *Mobil Oil Co.* v. *F.P.C.*, 483 F.2d 1238, (D.C. Cir. 1973); *Walter Holm & Co.* v. *Hardin*, 449 F.2d 1009 (D.C. Cir. 1971); *Buckeye Power Co.* v. *EPA*, 481 F.2d 162 (6th Cir. 1973); *Appalachian Power Co.* v. *EPA*, *supra*.

[70] Government's Br. at 43.

[71] *Id.*, at 43, 47.

[72] S. REP. No. 752, 79th Cong., 1st Sess. 14-15 (1945).

In endorsement of this trend, the Administrative Conference of the United States adopted, in June, 1976, *Recommendation 76-3, Procedures in Addition to Notice and Opportunity for Comment in Informal Rulemaking*, "specifying for agency consideration certain procedures going beyond notice-and-comment, and . . . describing some of the 'circumstances of particular proceedings' that should move agencies to consider such additional procedures." ADMINISTRATIVE CONFERENCE OF THE UNITED STATES, 1976 REPORT (March, 1977).[73]

Additional procedures[74] were especially recommended when

> "(1) the scientific or other data relevant to the proposed rule are complex;
>
> * * * *

[73] The full text of the Recommendation, as adopted, is at page A-43 of the Appendix to this Brief.

[74] The additional procedures recommended were the following:

— Advance notice of rulemaking when the issues raised by the rulemaking were anticipated to be unusually complex;

— Providing for two cycles of notice and comment when comments filed in the proceeding present new and important issues or serious conflicts of law;

— Incorporating in the notice a description of the data on which the agency relies;

— Providing an explanation of the tests and other procedures followed by the agency and the significance the agency attached to them;

— Holding conferences open to the public *with an opportunity for all interested groups to question one another*;

— Hearing argument and other presentations, *with questioning, including cross-examination or questions submitted by interested persons*. [emphasis supplied]

Recommendation 76-3, *supra*.

> (3) the costs that errors in the rule may impose, including health, welfare and environmental losses imposed on the public and pecuniary expenses imposed on the affected industries and consumers of their products, are significant."

Recommendation 76-3, supra.

The approach advocated by the Administrative Conference has also been endorsed by the Committee on Governmental Affairs of the United States Senate, in a multivolume STUDY OF FEDERAL REGULATION.[75] Quoting with approval from the decision of the Court of Appeals in this case,[76] it proposed that agencies adopt a model "hybrid" rulemaking procedure designed to assure full ventilation of important policy issues involving complex factual questions."[77]

Likewise, commentators on administrative procedure have recommended additional procedures beyond the minima provided by the Administrative Procedure Act in complex, technical areas, in order to assure the development of an adequate record:

> "[I]n at least a significant number of instances agencies should thus exercise their discretion to fashion hybrid or conglomerate procedural devices which would utilize those characteristics of both adjudication and rulemaking that are most appropriate in

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[75] U.S. SEN. COMM. ON GOVERNMENTAL AFFAIRS, STUDY OF FEDERAL REGULATIONS, prepared pursuant to S. Res. 71, 95th Cong., 1st Sess. (July, 1977).

[76] The study added:

> "Whether the label rulemaking or adjudication is attached to the procedure is not so important as whether the procedure provides a full opportunity for all interested persons to make their views known in a timely fashion."

Id., Vol. 4, at 37.

[77] *Id.*, at 39-45.

> light of the circumstances and issues of the particular case. It is submitted, further, that, like any other exercise of agency discretion, an agency's decision whether to employ procedural devices not uniformly required by statute is subject to judicial review for abuse of discretion and should be set aside when such abuse is found.[78]

Perhaps especially significant, those who have studied the process of informal rulemaking in technical areas at first hand—as officials of agencies engaged in such rulemaking—have voiced their support for this development in the law of administrative procedure.[79]

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[78] Bruce McAdoo Clagett, *Informal Action—Adjudication—Rulemaking: Some Recent Developments in Federal Administrative Law*, 71 DUKE L.J. 51 (1971). Davis, ADMINISTRATIVE LAW OF THE SEVENTIES, SUPPLEMENT TO ADMINISTRATIVE LAW TREATISE, Sec. 6.04-1 (1976). *See also* Robert W. Hamilton, *Procedures for the Adoption of Rules of General Applicability: the Need for Procedural Innovation in Administrative Rulemaking*, 60 CALIF. L. REV. 1276 (1972); Barry B. Boyer, *Alternatives to Administrative Trial-Type Hearings for Resolving Complex Scientific, Economic and Social Issues*, 71 MICH. L. REV. 111 (1972); Richard B. Stewart, *The Development of Administrative and Quasi-Constitutional Law in Judicial Review of Environmental Decisionmaikng: Lessons from the Clean Air Act*, 62 IOWA L. REV. 713 (1977).

At least two students of the Commission's rulemaking have specifically urged the need for cross-examination, on grounds of:

> (1) The need for questioning to enable parties to discern the accuracy of evidence when factual matters are disputed,
>
> (2) The public's perception of the Commission's fairness, upon which the Commission's credibility depends, and
>
> (3) The need for accuracy in the initial rule to avoid later challenges to it, so that the rulemaking process might live up to the promise of efficiency which caused the agency to choose rulemaking originally.

Comment, *Generic Rulemaking*, 61 U. VA. L. REV. 390 (1971); Johnston, *AEC Rulemaking and Public Participation*, 62 GEO. L.J. 1737 (1974).

[79] William F. Pedersen, Jr., *"Formal Records and Informal Rulemaking,"* 85 YALE L.J. 38 (1975).

Indeed, except in the Commission's fuel cycle rulemaking, "hybrid rulemaking" has virtually become the norm in major rulemaking proceedings across the federal government. In September, 1976, the Administrative Conference sent a letter to 35 federal agencies in order to assess their compliance with its Recommendation 76-3. As of July, 1977, responses had been received from 22 agencies. These responses indicate that the procedures suggested by the Conference are in many agencies already a routine part of their operating procedure [80] and have

[80] The procedures suggested by the Administrative Conference in Recommendation 76-3 have been adopted by numerous federal agencies. The following is a summary of the instances reported to the Administrative Conference. Information respecting the Environmental Protection Agency, Consumer Product Safety Commission, and the Federal Energy Administration was not available, although these agencies have also used "hybrid" procedures.

(a) Advance notice of proposed rulemaking has been used by the Civil Aeronautics Board ("CAB") (*see* 37 Fed. Reg. 15518 (Aug. 3, 1972), 40 Fed. Reg. 24740 (June 10, 1975)); the Commodity Futures Trading Commission ("CFTC"); the Civil Service Commission ("CSC"); the Federal Communications Commission ("FCC"); the Federal Reserve Board ("FRB"); the Department of Health, Education and Welfare ("HEW"); the Department of Labor ("Labor"); and the Small Business Administration ("SBA") (30 Fed. Reg. 39478 (Nov. 7, 1974)).

(b) Two or more cycles of rulemaking have been instituted by the CAB (41 Fed. Reg. 13616 (March 31, 1976)); CSC; CFRC; FCC; the Federal Home Loan Bank Board ("FHLBB"); FRB; FTC; (Two cycles of rulemaking are *always* used in FTC and SBA, (*e.g.*, 39 Fed. Reg. 22802 (August 24, 1973); and 41 Fed. Reg. 24915 (June 21, 1976)).

(c) Public conferences or question and answer sessions have been utilized by CAB (41 Fed. Reg. 18704 (May 6, 1976); CSC; CFTC (questions from the public are presented to witnesses by the Commissioners); FCC; FHLB; FRB; FTC (Public hearings are held on *all* rules); HEW (41 Fed. Reg. 56966 (December 30, 1976) on the Education of Handicapped Children Act of 1975 over 20 public meetings were held with about 2200 people attending); ICC (Ex. Parte No. Mc-19, Ex Parte No. Mc-77); Labor, SBA (36 Fed. Reg. 25052 (Dec. 28, 1971), 40 Fed. Reg. 25831 (June 19, 1975), 41 Fed. Reg. 37817 (Sept. 8, 1976)); and the Department of State ("State").

[Footnote continued on page 55]

[80] [Continued]

(d) Oral argument is a procedure employed by CAB (37 Fed. Reg. 6322 (March 28, 1972); CSC; EEOC; FCC; FRB; HEW; ICC; ITC; Labor; SBA; and State.

(e) Many agencies, in their attempt to open up the rulemaking process to the public, have added other procedures, especially the dissemination of rulemaking information to a wide range of parties rather than relying on Federal Register notice alone. *E.g.*, HEW; Labor; CSC; CAB.

(f) The Administrative Conference' survey asked agencies "what steps they had taken to ensure that interested persons are given an opportunity to indicate issues of specific fact they contest as to which cross-examination is appropriate." Most of the responding agencies found that cross-examination was not appropriate to the type of general policy rulemaking they undertake, but several suggested that they have either provided such an opportunity (HEW, ICC, FTC) or would do so in the future (ITC, CFTC, CSC).

(g) Agencies were also asked by the Administrative Conference if they had used cross-examination in notice-and-comment rulemaking proceedings. They replied as follows. The CAB had plans to use cross-examination in a proposed rulemaking proceeding (40 Fed. Reg. 37048-50 (Aug. 25, 1975)); the FCC allowed cross-examination; the FRC allows cross-examination on "disputed issues of fact that are material and necessary to resolve;" the FMC calls a full evidentiary hearing whenever the Commission decides that a proposed rule requires the taking of evidence; the ICC allows cross-examination and the SBA permits questioning but questions are to be presented through the hearing Chairman (40 Fed. Reg. 25831 (June 19, 1975), 40 Fed. Reg. 32142 (July 31, 1975)).

(h) Those agencies which do not use techniques such as cross-examination in their proceedings indicated to the Administrative Conference that cross-examination would be useful in circumstances which have not arisen before their particular agency. For example, the Veterans Administration noted that the failure of the VA to provide cross-examination in rulemaking is because it is confined to mainly technical and administrative implementation of the law. Letter of November 11, 1976, from Richard L. Roudebush, Administrator, to Administrative Conference.

This information was compiled from the responses to the Administrative Conference's questionnaire at its office, 2120 "L" Street, N.W., Washington, D.C. 20037.

been found to be useful in informal rulemaking in factually complicated settings.[81]

In summary, the petitioners in this case have asked the court to adopt a strained interpretation of the decision of the Court of Appeals—ignoring the manifold and obvious deficiencies in the record outlined clearly in the lower court's opinion, and ignoring the fact that the court specifically refused a request from the environmental organizations to rule that the agency must accord them procedures in addition to those employed in the rulemaking. They thus ask to destroy important developments in the judicial implementation of the Administrative Procedure Act to oversee the increasingly ubiquitous activities of federal administrative agencies. As we have indicated previously the opinion of the Court of Appeals is grounded solidly on the inadequacies of the record before the Commission. We submit that neither law nor policy justifies the kind of contortion of the lower court's holding proposed by the petitioners.

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[81] According to responses to the Administrative Conference's questionnaire, the agencies employing cross-examination in rulemaking have invoked it "to resolve decisionally significant factual dispute which cannot be effectively resolved in other ways" (FCC—letter of October 27, 1976, from Richard E. Wiley, Chairman, to the Administrative Conference); "at [oral hearings at] which complex factual issues will require detailed examination" (ICC—letter of November 2, 1976, from George M. Stafford, Chairman, to the Administrative Conference); when "issues [are] complex, public interest [is] great, and the public views expressed [are] widely differing" (SBA—letter of September 17, 1976, from Mitchell P. Kobelinski, Administrator, to Administrative Conference; and when "recognizing the desirability of subjecting the empirical studies expected to be developed to cross-examination" (CAB—letter of October 21, 1976, from Lee R. West, Member, to the Administrative Conference). *Id.*

III.

VERMONT YANKEE COULD NOT BE LICENSED WITHOUT CONSIDERING THE ENVIRONMENTAL IMPACT OF REPROCESSING AND DISPOSING OF ITS WASTES.

While it scrupulously took no position as to the kind of proceeding needed to assure the full consideration of waste disposal, fuel reprocessing, and other elements of the nuclear fuel cycle, the Court of Appeals held flatly that NEPA forbid the Commission from licensing a nuclear plant without *any* consideration of these issues.[82] Thus the operating license issued to Vermont Yankee was remanded to the Commission to await the outcome of the renewed rulemaking proceeding with respect to these issues. App. 40.

This ruling was so obviously correct that it is disputed by no one before this Court save Vermont Yankee. (The

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[82] As a result of the twists and turns of the Commission's policy with respect to considering the environmental impact of the nuclear fuel cycle, these issues had been considered with respect to Vermont Yankee in neither the licensing proceeding nor under the Commission's rulemaking.

As outlined in the Statement of Facts, *supra* ,8-9, the Commission, through its Licensing Appeals Board, had held that the issues of fuel reprocessing and waste disposal were not to be considered in the licensing proceeding for the plant. Decision of the Atomic Safety and Licensing Appeal Board of June 6, 1972, ALAB-56, App. 112, 115; Decision of the Atomic Safety and Licensing Appeals Board of February 28, 1974, ALAB-179, App. 130, 136-7.

Subsequently, in promulgating its final rulemaking with respect to the nuclear fuel cycle, the Commission specified that no consideration of fuel cycle issues need be provided in cases where any Final Environmental Statement had been circulated prior to June 6, 1974. 10 C.F.R. Part 51, § 51.20(e), App. 398. By virtue of the fact that the Statement for Vermont Yankee had been circulated prior to June 6, 1974, no consideration of waste disposal and fuel reprocessing was undertaken pursuant to the amendment to the Commission's rules, either.

government conceded that an Environmental Impact Statement for a nuclear power plant must consider fuel cycle issues when it proposed the rule under review in this case.)

In support of its position, Vermont Yankee half-heartedly relies upon this Court's decision in *Kleppe* v. *Sierra Club*, *supra*. Vermont Yankee's Br. at 39-45. In *Kleppe*, this Court held that NEPA did not require the preparation of a programmatic Environmental Impact Statement with respect to the leasing of coal development lands in the West because the Interior Department did not have a coherent plan or program for leasing coal-bearing lands. In a strained analogy, Vermont Yankee urges that the environmental impact of nuclear wastes are similarly remote from the operation of a nuclear power plant.

The differences between these two situations are obvious. The environmental impacts of reprocessing and disposal of spent fuel from Vermont Yankee are a direct, irreversible consequence of the operation of the facility. They are "adverse effects," "irreversible and irretrievable commitments," NEPA, Section 102(2)(C)(ii) & (v), 42 U.S.C. § 4332(2)(C)(ii) & (v), that cannot be avoided once the reactor begins operation. As the Court of Appeals stated, the environmental effects of nuclear waste reprocessing and disposal are as much a part of operating Vermont Yankee as are the environmental effects of "the stack gases produced by a coal-burning power plant." App. 33.[83] The contrast with the wholly separable coal

[83] The correctness of this statement was recently recognized by the Congress. In enacting the Clean Air Amendments of 1977, it mandated the Environmental Protection Agency to develop ambient air quality standards for radioactive releases from nuclear power plants, and the States to develop "State Implementation Plans" containing emission limitations for these emissions, through precisely the same regulatory mechanism that had previously been used to develop such standards and limitations for sulfur oxides, particulate matter, and nitrogen oxides emissions from fossil-fuel fired power plants. Section 120(a) of the Clean Air Amendments of 1977, adding a new Section 122 to the Clean Air Act, 42 U.S.C. 7422.

leases involved in *Kleppe* could hardly be more stark. Thus the Court of Appeals was entirely correct when it stated that

> "What the agency may not do, consistent with NEPA, is to fail to give these issues consideration in either [the licensing or rulemaking] forum."

App. 40, n. 17.

CONCLUSION

Respondents have previously urged that the Court of Appeals' decision was an unexceptionable exercise of the federal courts' supervisory powers over the administrative agencies. The Commission's rulemaking was a far cry from reasoned decisionmaking. Rather, it amounted to an attempt to stifle public discussion of some of the most profoundly troubling issues concerning the Nation's rapidly increasing dependence on nuclear power stations. Though embarrassing to the Commission, these issues must be addressed.

Experience has shown that when foreign governments have denied a forum for the presentation of sincerely held and reasonable concerns over these issues, extra-legal action has sometimes been the result. In several countries, disagreement over nuclear power has produced violent confrontations. Even in this country demonstrators have recently occupied the site of a proposed nuclear power station in New Hampshire.

It is the duty of the courts to forestall the development of the perception of government illegitimacy that fosters resort to such measures. In commanding the Commission

to confront its critics on nuclear wastes within legal processes, the Court of Appeals thus acted wisely as well as according to law. Its judgment should be affirmed.

Respectfully submitted,

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September, 1977

Supreme Court, U. S.
FILED
NOV 26 1977
MICHAEL RODAK, JR., CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.,
Respondents.

No. 76-528

CONSUMERS POWER COMPANY, *Petitioner,*

v.

NELSON AESCHLIMAN, et al., *Respondents.*

SUPPLEMENTAL STATEMENT OF FACTS OF RESPONDENTS

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PRESS OF BYRON S. ADAMS PRINTING, INC., WASHINGTON, D. C.

IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.,
Respondents.

No. 76-528

CONSUMERS POWER COMPANY, *Petitioner,*

v.

NELSON AESCHLIMAN, et al., *Respondents.*

SUPPLEMENTAL STATEMENT OF FACTS

The following facts, not formally part of the record of this case, but matters of public record, are crucial to the Court's analysis of the issues presented for review in this case.

1. The Vermont Yankee nuclear power station has now been granted a full-term operating license. The opinion of the court below remanded Vermont Yankee's original operating license, pending further pro-

ceedings in the generic waste rulemaking that was held inadequate in the same decision. Subsequently, as noted in respondents' brief (Br. at 23-24), the Nuclear Regulatory Commission ("Commission") promulgated an "interim" rule for consideration of the environmental effects of nuclear wastes in the licensing of nuclear power stations.

Thereafter, the Commission was asked by an intervenor to rescind entirely the license that had been granted to Vermont Yankee. In the opinion attached to this filing, the Commission rejected this request. Applying the Commission's interim rule, the opinion stated the Commission's view that the environmental hazards of nuclear wastes were insufficient to overcome the expenses made on the already-completed plant. The time for seeking court review of that decision has expired, and no Petition for Review has been filed.

2. As noted in respondents' brief (Br. at 24), the Commission commenced a new rulemaking proceeding to assess anew environmental questions held by the Court of Appeals to have been inadequately assessed in the Commission's previous rulemaking. 42 *Fed. Reg.* 26987 (May 26, 1977). The purpose of this new rulemaking is to establish new estimates of the environmental effects of certain elements of the uranium fuel cycle, based on a fuller record. The procedures established for this rulemaking provide for greater participation by the public than those of the rulemaking overturned by the Court of Appeals' decision.

We request that the Court consider these facts in focussing on which, if any, issues remain for the Court to review in this case.

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APPENDIX

APPENDIX

Cite as 6 NRC 25 (1977) ALAB-421

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARDS

Michael C. Farrar, Chairman (Docket 50-271)*
Alan S. Rosenthal, Chairman (Dockets 50-443 and 444)
Dr. John H. Buck
Dr. Lawrence R. Quarles (Docket 50-271)**

In the Matters of

Docket No. 50-271
VERMONT YANKEE NUCLEAR POWER CORPORATION
(Vermont Yankee Nuclear Power Station)

Docket Nos. 50-443, 50-444
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, et al.

(Seabrook Station, Units 1 and 2)

July 18, 1977

In response to ALAB-392, 5 NRC 759 (April 21, 1977), an intervenor filed a motion seeking (1) a determination that the values in the interim S-3 tables tip the cost-benefit balance of the Vermont Yankee and Seabrook facilities in favor of abandonment; and (2) certification to the Commission of the question of whether the interim S-3 tables

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* Mr. Farrar is also a member of the Appeal Board in Dockets 50-443 and -444.

** Dr. Quarles participated in the deliberations on the matters considered in this opinion and indicated his general agreement with the conclusions which are reached herein. He did not, however, review the final version of the opinion.

should be used in light of the President's recent policy statements concerning nuclear power. The Appeal Board (1) finds no compelling reason to certify the intervenor's question to the Commission and hence denies that request; (2) determines that the cost-benefit balance for Vermont Yankee is not tipped in favor of abandonment of the facility by the environmental impacts quantified in the interim fuel cycle rule; and (3) reserves for its decision on the merits of the pending *Seabrook* appeals the fuel cycle issues relating to that facility.

Rules of Practice: Appellate Procedure

The Appeal Board exercises its authority to certify a question to the Commission under 10 CFR § 2.785(d) sparingly. Absent a compelling reason, it will decline certification.

Messrs. John A. Ritsher, Thomas G. Dignan, Jr., and R. K. Gad, III, Boston, Massachusetts, for the Vermont Yankee Nuclear Power Corporation and Public Service Company of New Hampshire, *et al.*

Mr. Anthony Z. Roisman and Mrs. Karin P. Sheldon, Washington, D.C., for the New England Coalition on Nuclear Pollution.

Messrs. Joseph F. Scinto, Myron Karman and Edwin J. Reis for the Nuclear Regulatory Commission staff.

Memorandum and Order

By its order of April 1, 1977,[1] the Commission directed us to determine the impact of its just promulgated interim fuel cycle rule[2] on the environmental cost-benefit balances which had been struck for each of ten nuclear facilities

[1] CLI-77-10, 5 NRC 717.

[2] The interim rule issued on March 14, 1977. 42 Fed. Reg. 13803.

specified in that order. As the first step in the carrying out of that direction, we entered our own order three weeks later[3] in which, *inter alia*, we announced that we would entertain further submissions by a party or parties with respect to any of either those ten facilities or three other facilities which still had uranium fuel cycle questions pending before us. The submissions were to "be confined in scope to an assignment of reasons why, in light of the interim rule, the cost-benefit balance for the facility or unit in question tips, or might tip, in favor of abandonment of the facility." 5 NRC at 765.

The only party which accepted that invitation was the New England Coalition on Nuclear Pollution, an intervenor in the licensing proceedings involving the Vermont Yankee and Seabrook facilities.[4] Its filing was not, however, restricted to the impact of the interim rule (and, more particularly, the numerical values assigned in revised Table S-3 for the spent fuel reprocessing and waste disposal phases of the fuel cycle) upon the cost-benefit balances for those reactors. Rather, although contending that application of the interim rule would tip the balance against both Vermont Yankee and Seabrook, the Coalition's primary point is that we should certify to the Commission the following question.

> Should the cost-benefit balance for individual reactors be restruck using the interim S-3 Table values issued on March 14, 1977, in light of the statement by President Carter on April 7, 1977, that the fuel cycle scenario upon which those values were based is being indefinitely deferred?

[3] ALAB-392, 5 NRC 759 (April 21, 1977).

[4] The staff and licensees filed papers setting forth their views on certain questions relating to the application of the interim rule which had been posed in ALAB-392 on behalf of some Appeal Panel members. These questions are addressed in Mr. Farrar's concurring opinion, *infra*.

By way of elaboration, the Coalition tells us that

> On April 7, 1977, and again on April 20, 1977, the President of the United States announced as national policy the indefinite deferral of any plutonium recycling, thus effectively cancelling the fuel cycle scenario upon which the current interim S-3 Table is based. Legal principles, logic and national policy dictate that the Appeal Board not go through the essentially meaningless process of evaluating the impact on the cost-benefit analysis for an individual facility of the interim S-3 Table which is based upon a fuel cycle scenario which is inconsistent with the decision of the President of the United States.
>
> The documents underlying the interim S-3 Table, NUREG-0116 and 0216, include brief discussions of some fuel cycle options which do not include plutonium recycle. However, only the S-3 Table itself is adopted as the rule and that Table does not include any analysis of the no recycle scenario. In addition, both NUREG-0116 and 0216 candidly admit that the data on the no-recycle scenarios is seriously defective.

Responses to the Coalition's submission were filed by the applicants/licensee in the two proceedings and the NRC staff. Those parties oppose the certification request and also disagree with the Coalition's assessment of the impact of the interim rule upon the cost-benefit balances for these facilities.

A. Although our authority to certify a question to the Commission is beyond doubt (10 CFR § 2.785(d)), we have more than once observed that "such authority should be exercised sparingly." See *e.g. Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-211, 7 AEC 982, 984 (1974); *Consolidated Edison Co. of New York* (Indian Point Nuclear Generating Station, Unit 3), ALAB-186, 7 AEC 245, 246 (1974) and cases

there cited. Thus, "[a]bsent compelling reason, we will decline to certify a question to the Commission." ALAB-211, *supra*, 7 AEC at 984.

A compelling reason for certification is not discernible here. It is an absolute certainty that the Commission is fully aware of the statements of the President upon which the Coalition relies. And we may fairly presume that, if it were of the view that those statements affected in some manner the continuing validity of its interim uranium fuel cycle rule, the Commission would have initiated itself the appropriate steps to bring about the necessary revisions. The ink on the interim rule was barely dry when the President announced on April 7 his policy looking to an indefinite deferral of "the commercial reprocessing and recycling of the plutonium produced in U. S. nuclear power programs." It is thus scarcely likely that the Commission's memory of the content of the interim rule had by then dimmed to such an extent that any bearing which that new policy might have had on the rule would have been overlooked.[5]

B. As the Coalition of necessity acknowledges, Vermont Yankee is a fully constructed and operating reactor. If its abandonment at this juncture would—or even might—necessitate the construction of some alternative generating

---

[5] Both the companies and the staff challenge the correctness of the Coalition's premise that the interim rule does not encompass the option of no recycling of plutonium. We are pointed to the statement in footnote 1 to Table S-3 to the effect that:

> The contributions from reprocessing, waste management and transportation of wastes are maximized for either of the 2 fuel cycles (uranium only and no recycle).

Although this statement would appear to undercut the ground assigned for the certification request, we prefer to rest our denial of the request on the considerations which we have set forth in the text above.

facility in order to meet power demands, revocation of its operating license could not possibly be justified by the environmental impacts of the uranium fuel cycle as quantified in Table S-3 of the new interim rule. When the then Atomic Energy Commission promulgated the original Table S-3 in 1974, it characterized those impacts as "relatively insignificant." See ALAB-392, *supra,* 5 NRC at 760. Although the interim rule now in force has brought about some revisions in the portions of the table relating to the spent fuel reprocessing and waste disposal phases of the fuel cycle, in its April 1 order (CLI-77-10, *supra*) the Commission took pains to

> . . . restate our belief, expressed in the statement of considerations accompanying the interim rule, that the values in the old rule and those in the interim rule are not substantially different and, therefore, although conceivable, it appears unlikely that use of the interim rule values rather than those in the original rule could tilt a cost-benefit balance against a facility, thus requiring suspension of an outstanding license or permit, or denial of a permit that would otherwise have been approved.

5 NRC at 717b. On the other hand, heavy economic costs (and perhaps environmental ones as well) would attend upon the construction of the substitute facility. Additionally, there would be the matter of fulfilling power demands pending completion of that facility—which also might well bear, at minimum, a high price tag.

The Coalition tells us, however, that there is no current need for the power that is being generated by Vermont Yankee. It relies on a January 1, 1977, report of the New England Power Pool (NEPOOL) for the proposition that, were the generating capacity of Vermont Yankee to be unavailable from now until 1980, New England would still

have adequate reserve margin to meet its needs.[6] In this connection, the Coalition insists that, because of what it considers to be a present "national policy that nuclear power should be used as a last resort," the continued operation of Vermont Yankee cannot be justified on the basis that it might serve as a substitute for an existing fossil fuel generating plant.

The licensee's rejoinder is that it appears from an affidavit of the Chief Engineer of the Vermont Public Service Board submitted to the Licensing Board last September[7] that a six-month shutdown of Vermont Yankee would increase the cost of electrical energy to Vermont Yankee's wholesale customers in Vermont by an amount approaching $24 million and to New England ratepayers in total by approximately $50 million. The licensee also disputes that the President's announced policy forecloses the use of nuclear facilities for the purpose of conserving petroleum. For its part, the staff has appended to its response to the Coalition the affidavit of Richard E. Weiner, an electrical engineer in its Antitrust and Indemnity Group who is responsible for "coordinating and conducting in-depth analys[es] of the planning, operating and coordinating functions of many types and sizes of electric utilities throughout the country." According to Mr. Weiner, oil-fired units would have to be used to make up the lost generating capacity of Vermont Yankee. This would entail an economic penalty in terms of increased costs of approxi-

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[6] The Coalition regards the post-1980 need for the facility to be "speculative."

[7] Affidavit of Gordon B. Stensrud, dated September 30, 1976, attached to the memorandum of law filed by the State of Verment on the same date in response to the Licensing Board's order of August 13, 1976. In that memorandum, Vermont opposed the suspension or modification of the Vermont Yankee operating license pending the promulgation of a new interim fuel cycle rule.

mately $186,000 per day and an additional daily consumption of 19,000 barrels of oil.

We need not pass judgment here on the precise degree of accuracy of these estimates. It is enough to conclude, as we do, that the environmental impacts assigned by the interim rule to the uranium fuel cycle are far too small to justify the summary elimination of more than 500 MWe in existing generating capacity. In this regard, we do not understand the President to have decreed as a matter of national policy, either in the statements upon which the Coalition relies or elsewhere, that already constructed and operating nuclear facilities are now to be abandoned in favor of other nonnuclear energy sources (which may not even be presently available).

In thus holding that Vermont Yankee's status as a fully built facility is determinative here, we do not overlook the fact that the Natural Resources Defense Council sought unsuccessfully to raise uranium fuel cycle issues with regard to this facility as far back as 1971. See ALAB-56, 4 AEC 930 (1972). But even then it was too late in the day, for the facility had been essentially constructed and was in an operating license proceeding. Stated otherwise, had the interim rule been in place in 1971 and applied to Vermont Yankee at that time, the result necessarily would have been the same as that reached today. Thus, the passage of time has not been prejudicial to the Coalition.

C. In contrast to Vermont Yankee, the Seabrook facility is still in the early stages of construction. It is also still before us on the appeals taken from the initial decision of the Licensing Board authorizing the issuance of construction permits. LBP-76-26, 3 NRC 857 (1976). Because several of the issues which remain to be decided on those appeals relate to the NEPA cost-benefit balance for Seabrook, it is appropriate that we consider and decide the fuel cycle question along with them.

For the foregoing reasons, we (1) *deny* the Coalition's request for certification; (2) *determine* that the cost-benefit balance for Vermont Yankee is not tipped in favor of abandonment of the facility by the interim fuel cycle rule; and (3) *hold* for our decision on the merits of the pending *Seabrook* appeals the fuel cycle issues relating to that facility.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

FILED
SEP 30 1977
MICHAEL RODAK, JR., CLERK

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APPENDIX TO BRIEF OF RESPONDENTS NATURAL RESOURCES DEFENSE COUNCIL INC., ET AL. IN NO. 76-419

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COMMENTS OF THE NATURAL RESOURCES DEFENSE COUNCIL, INC., ON THE ATOMIC ENERGY COMMISSION'S ENVIRONMENTAL SURVEY OF THE NUCLEAR FUEL CYCLE

Submitted by:

TERRY R. LASH, Ph.D.
January 26, 1973

I. INTRODUCTION

The Natural Resources Defense Council, Inc. (NRDC), finds the Environmental Survey of the Nuclear Fuel Cycle inadequate as a comprehensive analysis of the environmental impact of the nuclear fuel cycle and seriously deficient as a supporting document for the environmental impact statements of individual nuclear power plants. These defects are so serious that the survey is not useful for informing the public about the environmental effects of relying upon nuclear power plants as a major, national source of electrical power. Without a detailed study of the total environmental impact of the nuclear fuel cycle, a rational choice among the alternatives for electrical power production cannot be made. Therefore, the AEC should issue a revised survey in order to inform the public fully about the environmental consequences of using nuclear power plants to produce electrical power.

II. SCOPE OF SURVEY

Major defects of the survey statement are its failure to consider: (1) the *total* environmental impact of *all* nuclear power plants that are in operation, under construction or planned for construction; (2) the cumulative environmental effects over the entire lifetime of each plant; (3) the plutonium fuel cycle; and (4) the liquid metal fast breeder reactor. The environmental effects due to using nuclear power are apparently reduced by a factor of 200 to 1000 in the survey by considering only one plant rather than the aggregate of planned operational plants. Orders have already been placed for 177 nuclear power plants as of December, 1972, and it is estimated that 1000 plants will be in operation by the year 2000. (WASH-1250. The Safety of Nuclear Power Reactors and Related Facilities, December, 1972.) The total impact of all these nuclear power plants should

have been assessed in addition to the analysis of only one model plant.

Because each nuclear power plant may be used for 30-40 years, the environmental degradation caused over a plant's expected lifetime should have been reported. By normalizing outputs to one year of production the total environmental impact was apparently reduced by a factor of 30-40. Therefore, the cumulative consequences of constructing and operating a nuclear power plant should be listed in addition to its annual effects. Furthermore, the fate of the plant after it has stopped operating should be described. No mention of its continuing environmental hazard is made.

Plutonium is a natural fission product of a light water reactor (LWR) and must be handled at reprocessing plants. Furthermore, the reclaimed plutonium will be required as a fuel during a substantial portion of an LWR's 30-40 year design life due to the scarcity of the currently used fuel U-235. Thus the plutonium fuel cycle is central to the issue of nuclear power production. The fact that ". . . the prospective utilization of such plutonium recycle fuel is somewhat uncertain since the actual timing and the extent to which the recovered plutonium will be recycled is an economic matter to be considered by each utility" does not relieve the AEC from considering the *potential* environmental hazards of plutonium.

Plutonium is one of the most hazardous chemicals known. For plutonium dioxide particles about one micron in diameter, Donald Geesaman has estimated that for every 10,000 particles inhaled by a human population one fatal human lung cancer will occur. (GT-121-70, Plutonium and Public Health. Presented at University of Colorado, April 19, 1970). There is the same effect whether the 10,000 particles are inhaled by only one person or whether each of 10,000 people inhale one par-

ticle. By 1980 a model reprocessing plant will recover annually about 1500 metric tons of uranium and 8110 kilograms of plutonium. (John W. Gofman, In testimony before the Nuclear Study Committee of the Legislature of the State of South Carolina, Columbia, South Carolina, January 7, 1972). If only one-tenth of one percent of the annual production of plutonium were released as one micron sized particles and if only one-hundredth of one percent of the released particles were inhaled by humans, the plutonium would be responsible for 14 million fatal human lung cancers. Therefore a complete, detailed discussion about the processing, storage and transport of plutonium is required.

In the near future, plutonium will be used as fuel for liquid metal fast breeder reactors (LMFBR). The rapid development of LMFBR's is essential for the continued availability of relatively inexpensive nuclear power because they can utilize the most abundant U-238 isotope of uranium. The LWR's on the other hand can only use the relatively scarce U-235 isotope. Thus the facts that LMFBR's use plutonium and the LMFBR's are projected to become the major source of nuclear power in the next few decades strongly suggest that any discussion omitting LMFBR's is grossly deficient.

III. DISCISSION OF ENVIRONMENTAL IMPACT

Insufficient information for a realistic appraisal of environmental impact is presented in many parts of the survey. The omissions on two topics are especially disturbing. First, almost no consideration is given to the environmental consequence of rare or low probability events. For instance, in the discussion of temporary storage of liquid high-level radioactive wastes at reprocessing plants it is stated that ". . . the probability of an accidental release of radioactivity is considered to be extremely low and thus there would not be any signifi-

cant release to the environs." Not only are the very important qualifiers "extremely" and "significant" neither defined nor approximated in quantitative terms, but more importantly the potential results of substantial release to the surroundings are not even mentioned. The possibilities of evacuation of the local populous, the occurence of lung cancer among the exposed population, the costs of decontamination, and the possibilities of severe radiation exposure should be set forth in straightforward terms. Descriptions of the consequences of other events are similarly avoided by simply labeling them "incredible". The term incredible has no place in a technical report and it should be replaced by quantified probabilities. The dismissal of so-called low probability/high consequence events is not justified because there has not been a sufficiently long history of operating plants to judge probabilities accurately and because there is no way of predicting the chances of sabotage and terrorism against nuclear installations. Indeed, recent world and U.S. history suggest that even what were formerly incredible acts of violence now seem only too possible.

The second area containing major omissions is the discussion of long term storage of high-level radioactive wastes. No details about the "near-surface engineered storage facility" which will be built about 1980 are presented. Indeed, it is not even pointed out that the reprocessing plant operating at West Valley, New York, since 1966, apparently will not be able to comply with the AEC's regulation which prohibits the storage of high-level radioactive wastes at reprocessing plants for more than 10 years. More importantly, however, there is no discussion devoted to the problems associated with establishing a permanent, absolutely secure depository for the high-level radioactive wastes that will remain hazardous to man for tens of thousands of years. There is not even an analysis of the decision to no longer consider

the salt mines at Lyons, Kansas, as a satisfactory storage facility. A candid analysis of the necessity of permanently securing the high-level wastes and a full description of the requirements, including protection against sabotage, for permanent storage is needed.

The survey gives the impression of having been prepared hurriedly and almost carelessly. For instance, on page G-10, it is stated: "The spent fuel from a model LWR processed annually in a fuel reprocessing plant produces approximately 1000 gallons of radioactive liquid waste which, when converted to solid, weighs approximately 1.4-2.3 MT." Since for each ton of fuel reprocessed about 330 gallons on high-level liquid waste is produced, a model LWR yielding about 30 MT of spent fuel annually will produce about 10,000 gallons of liquid waste rather than the stated 1000 gallons. (WASH-1250. The Safety of Nuclear Power Reactors and Related Facilities, December, 1972.) Furthermore, Dr. Frank Pittman who is Director of the Division of Waste Management and Transportation at the Atomic Energy Commission has reported that a 1000 MWe nuclear power plant will produce about 8 tons of solidified waste rather than the stated 2 tons. (Remarks by Dr. Frank K. Pittman, before the American Nuclear Society Meeting, November 16, 1972.) Other errors can be found in the report, also. On page E-2 the amount (26 MT) of waste CaF_2 appears to have been underestimated by 30 percent if the figures given for the capacity of the model fuel fabrication plant are correct. About 34 MT of CaF_2 per model LWR plant would result annually from the neutralization of the UF_6 produced from 34.6 MTU which is the annual contribution from one model LWR. Thus, the presentation should be carefully reconsidered in order to eliminate these and any other gross errors.

IV. CONCLUSION

NRDC finds the Survey sufficiently inadequate in scope of content and in completeness of discussion that it cannot usefully serve either as a supporting document for individual environmental impact statements or as a comprehensive survey of the environmental impact of the nuclear fuel cycle. In order to assist the public in understanding the environmental implications of using nuclear power plants to meet the national electrical energy requirements, the survey must be enlarged to include complete and detailed discussions of the plutonium fuel cycle, the cumulative effects of the entire complement of nuclear power plants and the environmental impact of the fast breeder reactor program. The topics which are covered in the survey need to be analyzed more accurately and in greater detail.

Docket No. RM 50-3

In the Matter of

AMENDMENT OF 10 CFR PART 50—LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

(Environmental Effects of the Uranium Fuel Cycle)

COMMENTS OF THE SIERRA CLUB ON "ENVIRONMENTAL SURVEY OF THE NUCLEAR FUEL CYCLE"

The Sierra Club submits herewith its comments on the Commission's "Environmental Survey of the Nuclear Fuel Cycle" and requests that these comments be made part of the record of the rule-making hearing to be held on February 1 and 2, 1973. The comments are intended to supplement comments and testimony offered by the Consolidated National Intervenors, of which the Sierra Club is a member.

Our comments are in two parts: Part One contains general observations on the Survey and the Commission proceedings, and Part Two focuses on specific features of the Survey.

GENERAL COMMENTS

This Survey or a successor document is clearly intended to play an integral role in the Commission's efforts to comply with the National Environmental Policy Act (NEPA) in regard to the environmental impact of civilian nuclear fuel cycle operations. Although we note the Survey's statement that it is not intended to be a detailed environmental statement under the Commission's NEPA regulations, the Commission's notice of November 15, 1972 (37 Fed. Reg. 24191) indicates that it does propose to use the Survey as evidence that NEPA has been complied with in LWR licensing proceedings. Such

use is contemplated under each of the two alternative regulations on which comment is invited by the notice.

The Survey is a useful document in many respects, but the Sierra Club is convinced that it is not legally or technically sufficient for its intended use. Many of the most important environmental risks and costs associated with the supporting fuel cycle for the nuclear power industry have been arbitrarily omitted from consideration or incompletely analyzed. Among the most prominent of these are plutonium handling and recycling, long-term storage of high-level wastes and thermal pollution. Our detailed criticisms of these and other areas where the Survey is inadequate are contained in Part Two.

As a result of these shortcomings, the environmental costs of the fuel cycle are seriously underestimated in the Survey. Thus the conclusion, under consideration in the Commission's first alternative, that these costs are sufficiently small as not to affect the cost-benefit analysis for an LWR, is not tenable. Even if the Survey's omissions and inadequacies in specific areas of environmental impact were disregarded, it still would not support the conclusion that the costs of the fuel cycle are negligible. In the absence of a common denominator by which to make direct comparison of the costs and benefits of a particular LWR, the final decision embodies large elements of judgment and subjective evaluation. The Survey does not attempt to elucidate this process of judgment and evaluation with regard to the costs of the fuel cycle. For the most part, the Survey is an exercise in data collection which is useful as far as it goes, but does not resolve the problem of translating the data into a meaningful environmental assessment. The selective comparisons of fuel cycle impacts to the impacts of coal-fired plants or the nuclear power station itself are misleading and unproductive because no such comparisons

are drawn in areas such as radiological effluents, where the comparisons would be adverse to the fuel cycle facilities.

The Survey is also unsuitable for the use proposed in alternative 2 because the costs of the fuel cycle are not fairly and completely set forth. Under the Commission's Rules of Practice, the Survey would be effectively insulated from challenge in LWR licensing proceedings once adopted for use in the manner proposed. Any correction of its basic shortcomings would have to take place in further rule-making proceedings. Meanwhile, the validity of licensing proceedings conducted along the lines of alternative 2 would be in doubt because of these shortcomings.

Until the Commission has resolved the inadequacies of the present Survey by more extensive findings and investigation in these rule-making proceedings, we believe the environmental impacts of the fuel cycle must be subject to examination by the Staff, the licensing Boards and interveners in the NEPA phase of individual licensing proceedings. We also believe the Commission should recast these rule-making proceedings to provide for the rights of discovery and cross-examination. Only by permitting the probing review afforded by these procedures can the Commission satisfy the mandate of NEPA and the public's demand that the environmental costs of the fuel cycle be explored to the full limit of our present intelligence. In undertaking this initial Survey, the Commission has taken an important step toward its goal of a comprehensive and reliable generic evaluation of the fuel cycle's environmental effects. We believe it can sooner realize that goal by opening the process of investigation and analysis to fuller public scrutiny and participation.

SPECIFIC COMMENTS

Plutonium Recycling

The Survey's most serious omission is its failure to consider the environmental impact of plutonium recycling in light-water reactors (LWRs). The Survey states that recycling of plutonium will be considered as an alternative LWR fuel cycle in a later document, but no date for the document is given. (S-2). The apparent rationale for deferring this vital matter is that the advent of plutonium recycling will vary somewhat between utilities, according to economic situations. (F-16-17). This variation in timing is the only reason given for not considering plutonium in the present Survey. The Survey does not question that plutonium will be recycled in the present generation of LWRs, and in fact affirms that the feasibiliy of mixed plutonium-uranium dioxide fuels has been shown. (*Ibid.*).

A lengthy discussion of the staggering problems in handling plutonium on a large scale is not necessary. Plutonium's extraordinary toxicity, radioactivity and longevity are well-known sources of concern to everyone in the nuclear industry. Almost as disturbing are the possibilities that diverted plutonium produced in LWRs could be traded in an international black market and used for production of nuclear explosives by unauthorized parties.

At the assumed 80 per cent load factor, the 1000 MWe plant considered in the Survey will produce slightly less than 200 Kg of plutonium per year. The Survey's estimates that about 2-3 MT of plutonium will be recovered annually by 1975, and about 15 MT by 1980 (F-16), therefore correspond to about 10-15,000 MWe and 50,000 MWe of generating capacity respectively. The Survey's overview states, however, that there is

already 10,000-12,000 MWe of operational nuclear power plants in the United States (0-1). In addition, several more operating licenses have been granted in recent months. For 1980, the Survey estimates that 140,000-150,000 MWe of nuclear generating capacity will be operational. (0-4). Thus it appears that, by the Survey's own figures, the amount of fissile plutonium passing through reprocessing plants in 1975 and 1980 has been underestimated by a factor of at least 2 and possibly 3.

Some reactors are already being fueled with mixed plutonium fuel, including Consumers Power's Big Rock Point plant and the San Onofre plant of Southern California Edison. Other plants will soon follow suit or may already be doing so. One of the sources cited in the Survey states flatly that "plutonium recycle in LWRs is an economic necessity in the U.S." Dawson, *et al.*, *Plutonium Utilization in Light-Water Reactors*, 4th U.N. Int'l Conf. on Peaceful Uses of Atomic Energy, A/CONF 49/P/071 (Sept. 1971). At least two utilities (Consumers Power and Duke Power) have filed comments urging the Commission to consider plutonium recycling in these proceedings or related proceedings to be promptly instituted.

Certainly the variations in utility plans for use of plutonium fuel in LWRs present some difficulties in quantitative analysis of the resulting environmental impact, but these difficulties are not insurmountable. The Survey deals with similar problems in other areas, such as the alternate methods now in use for production of UF_6 (C-1-2), and the use of underground or open-pit mining for uranium (A-1). In the case of plutonium recycling, the analysis could proceed on the basis of either a best estimate by the Commission of the extent of such recycling by 1980 or a survey of utilities to determine their present plans for that period. Either method would yield at least a range of alternate futures that would be

vastly preferable to the absence of any analysis in the present Survey. Furthermore, the problems of handling plutonium in the LWR fuel cycle can be meaningfully discussed even though the magnitude and timing of recycling are uncertain. The environmental challenges are immense even if only a very small fraction of the plutonium produced by LWRs is recycled. Thus the model reprocessing plant servicing the annual needs of 26 LWRs will be handling more than 5 MT of plutonium per year, even if the material is stored rather than recycled. The tolerable releases of plutonium to the environment through losses in reprocessing are extremely small, yet Section F of the Survey contains no discussion of either the existing or expected magnitude of these releases. Similarly, in the event of recycling, process losses at the fabrication plants would have to be drastically reduced from the 1% levels assumed for uranium (S-6), in order to limit plutonium releases to tolerable amounts. Yet the abilities of the reprocessing and fabrication plants to limit such losses are not discussed.

HTGR Fuel Cycle

The fuel cycle of the high-temperature gas reactor (HTGR) presents a series of difficult problems, particularly in dealing with fission products. We can agree that attempting to treat those problems in the present Survey might have detracted from the Survey's coherence. The recent increase in utility orders for the HTGR shows, however, that the environmental impact of its fuel cycle must be addressed at a very early date. The Survey gives no date for comparable proceedings in regard to the HTGR. Failing such proceedings, complete analysis of fuel cycle environmental effects in reactor licensing proceedings will be the only available method for compliance with the National Environmental Policy Act of 1969.

Thermal Pollution

The Survey fails to quantify or discuss in any significant way the thermal pollution associated with the fuel cycle. According to the Survey, the supporting fuel cycle for a 1000 MWe reactor consumes electrical energy equal to 4 to 5 per cent of the reactor's annual output and produces waste heat equal to about 7 per cent of that produced by the reactor (S-14, S-16). In both instances, the effect is overwhelmingly concentrated in the enrichment phase of the fuel cycle and is chargeable to the operations of the three gaseous diffusion plants existing in the United States (S-17). These effects are by no means insignificant, despite the modest appearance of the percentages. Any single industry or consumer which accounted for 4 to 5 per cent of the electric energy generated by nuclear power stations would have to receive major consideration in a demand-oriented analysis of the environmental effects of producing that energy. Similarly, since thermal electric generating plants are the major source of waste heat discharged to the biosphere and nuclear power plants contribute disproportionately to that effluent, an industry which discharges to the environment an amount of waste heat equal to 7 per cent of that discharged by all nuclear power plants is an important potential source of thermal pollution.

After quantifying these effects, however, the Survey does nothing toward analyzing their impact. The Survey dismisses the entire problem on the basis that the electricity which powers the diffusion plants is drawn from large utilities which discharge effluent to many water bodies, and the effect is therefore difficult to estimate. (S-36, D-5, D-13, D-26-27).

The Survey could have discussed this problem in meaningful terms, notwithstanding the difficulties in pinpointing the precise contribution of the nuclear fuel cycle to thermal pollution of affected water bodies. The power

in question comes from three utilities. (D-13). What are the major bodies of water which receive the discharges from the generating stations of these utilities? What contribution are these discharges making to the thermal load imposed on these water bodies, and what evidence exists that thermal loading is causing adverse effects to these water bodies and their biota? What portion of the power generated by these utilities is delivered to the gaseous diffusion plants, and what portion of the incremental demand for power from these utilities is represented by projected expansion of operations at these plants for civilian fuel production? Questions such as these could be the starting-point for a meaningful discussion of thermal pollution caused by the fuel cycle, even if limitations of data prevented a complete answer at present. Unfortunately, the Survey offers no encouragement that these questions were even asked. This omission takes on added importance because the Survey elsewhere relies on the future substitution of nuclear power plants for coal-fired plants in powering the gaseous diffusion plants as a source of environmental improvement. (O-14, 15). These projected future benefits must be discounted by the increased thermal pollution that is likely to result.

Total Environmental Impact of the Fuel Cycle

A critical defect in the Survey is that the *total* environmental impact of the fuel cycle is not set forth at any point. Although the Survey is replete with tables and charts, many of which are very helpful, the Survey merely suggests that the effects of the entire fuel cycle for the present and for 1980 can be arrived at by performing an extended series of computations from various other tables. (S-44). Conceivably, the total effects of the fuel cycle are treated in this peripheral way in the belief that only the incremental impact of a single plant is relevant in the licensing proceedings where the Survey

is designed to be used. Clearly it is important to know this incremental impact, but it is equally important for decision-making purposes to assess the acceptability of that impact in light of the collective effect that many similar decisions will ultimately have. Otherwise, the mistakes of the past may be repeated through the "tyranny of small decisions" against which the NEPA is directed. We find it very regrettable that the Survey does not candidly state the net impact of the LWR fuel cycle. In this respect the Survey belies its own title, and this defect alone casts a grave doubt on the propriety of its use in individaul licensing proceedings.

Fuel Cycle Effects After 1980

A related defect is the Survey's failure to address the problem of environmental impacts beyond the 8-year time frame to which it is limited. Admittedly, forecasts become less reliable as the time frame lengthens, and at some point they enter the realm of speculation. Nevertheless, the Survey must address these longer-term questions. It assumes that the model LWR will have an operating life of 30 years. (S-7). Thus reactors licensed in the present decade will have fuel cycle effects until the year 2010 in some cases. If these post-1980 effects are not assessed now, they will never be assessed for the present generation of LWRs. Since other benefits and costs of these reactors are calculated in relation to the reactor's entire useful life, the environmental costs of the supporting fuel cycle are underestimated if the analysis stops at the year 1980. If no further analysis is considered feasible at this point, the Commission should explore the possibility of periodically reviewing the fuel cycle impact of LWRs as this impact becomes more clearly defined with the passage of time. At the very least, there should be an explicit commitment to periodic updating of the Survey itself; otherwise, a reactor might

be licensed in 1978 with consideration of the fuel cycle effects extending only to 1980. The process of periodic review should include hearings giving members of the public the opportunity to contribute to the review and to probe the bases of the Survey's conclusions.

Radioactive Releases "As Low As Practicable"

The Survey does not explore in any manner the application to the operations of the fuel cycle of the concept that releases of radioactive effluents should be "as low as practicable." Throughout the discussion, release rates are compared to the maximum permissible concentrations set forth in 10 CFR 20, and the possibility of developing quantitative equivalents of "as low as practicable" similar to those in proposed Appendix I for nuclear power stations is not considered. Whether or not a specified environmental cost is tolerable depends considerably on whether it can reasonably be avoided. On this point, the Survey is uninformative and the problem is not satisfactorily addressed by the qualification (not consistently adhered to throughout the Survey, in any event) that only minimal allowance is made for future technological advances. We agree that the Survey should confine itself to present techniques and not speculate on future achievements. This does not mean, however, that the Survey should ignore any technology which is *presently available* but not incorporated in present facilities for economic or other reasons. A complete Survey must examine such possibilities, particularly in regard to the practicability of reducing radioactive effluents below existing levels in accordance with the overriding mandate of 10 CFR 20.1(c). In addition, the release rates are apparently based in several instances on AEC projections or information furnished by the operators of the facilities, rather than recorded data. (S-11, S-12). In light of the recent disclosure that releases from the Vermont Yankee plant are 3-8 times

greater than advance projections, the possibility that present releases are greater than the assigned figures is clearly suggested.

Liquid Effluents

Throughout the Survey there is reliance on dilution by water bodies to achieve even those concentrations permitted by Part 20. (S-32, D-26). This approach is questionable not only from the standpoint of radiation control, but equally from that of water quality control. Similarly, in respect to chemical effluents, the Survey relies on dilution to achieve "source water quality." (S-27, D-24, E-23, 24). Under the 1972 Amendments to the Federal Water Pollution Control Act now in effect, (P.L. 92-500), water quality standards will largely be supplanted by effluent standards for individual dischargers. The key indicator of the environmental impact of point sources such as those discussed in the Survey, therefore, is not the condition of the receiving water after full dilution, but the quality of the effluent itself. Since the Survey's reliance on 1968 Water Quality Criteria is now outmoded, all portions concerning discharges to navigable waters must be revised as the Environmental Protection Agency establishes effluent requirements applicable to the facilities in question.

Storage of High-Level Wastes

The Survey attempts to deal with the problem of interim and long-term storage of high-level radioactive wastes by denying that any such problem exists. The reader is merely assured that the Commission will design and build a storage facility within the next ten years that will preclude significant releases to the environment for 100 years, and that this 100 years will be utilized to discover a more permanent method that will likewise preclude such releases. (S-43, G-3, G-11, G-18,

G-20). In a religious document, this would be considered an article of faith.

No concept or details of the storage facility are set forth; hence there is no discussion of the probabilities of accidental releases, but only the bald statement that "the facility will be designed to withstand all credible natural forces and man-created accidents so there will be no release of radioactive material outside the facility." (G-20). If some other structure such as a bridge were in question, the presence of such unsolved problems might be tolerated on the assumption that the facility would not be constructed until the problems were solved, however long that took. This approach is not acceptable for a structure that *must* be built in a rather restricted time frame. Indeed, the Survey shows even though it does not directly concede, that the time may already be too short for full compliance with the requirement in Appendix F of 10 CFR Part 50 that high-level wastes be transferred to a Federal repository no more than 10 years after separation from the spent fuel. Even the brief discussion in Section G of the Survey shows that construction of the interim storage facility will be a large and complex undertaking. Plans are now said to be in the development stage, but there is no indication when a specific concept will be put forward for examination prior to preparation of detailed plans and specifications. (G-11). Furthermore, it appears from the meager information provided that no allowance has been made for unsuspected problems, re-evaluation and even abandonment of the plans as in the case of salt mine storage. Thus there are valid grounds to question whether the 1980 commitment is realistic and achievable. If it is not, Appendix F in its present form will be seriously violated. Amending the regulation would solve the problem in a technical sense, but the requirement was presumably adopted with due regard for the

hazards and limitations of on-site storage at the reprocessing plants, and there is no evidence that it is unduly conservative. Hence the Survey is totally inadequate in its treatment of a paramount environmental problem which neither the Commission nor the civilian nuclear industry can escape.

Major Accidents

The Survey's treatment of accidents is flawed by a persuasive tendency to classify the most serious kinds of accidents as "highly improbable" (S-36), "infinitesimally small," (S-43), etc., without specific supporting estimates of probability. Without question the probabilities of the most serious types of accident are very low, but this affords no excuse for failing to assess any probabilities greater than zero. Even very low probabilities can assume significance in light of the projected growth of the civilian nuclear power industry within the lifetime of the LWRs now being licensed and the concomitant growth of fuel cycle operations. In relation to the magnitude of these future operations, our experience to date is so limited that it has very little statistical significance as a guarantee of safety.

Effluents In "Restricted Areas"

The Survey implies at several places that waste discharges allegedly confined to "restricted areas" need not be considered as effluents to the environment (*e.g.*, S-27, B-20). These statements appear to reflect the belief that environmental harms can be disregarded by classifying the area in which they occur as restricted. We do not question the designation of certain areas as "restricted" for the purposes of protecting the public health and safety, but this does not mean that the areas so designated are no longer part of the environment. The Survey treats many of these areas as land temporarily committed, but there is little or no discussion of how much time and money will be required to return these areas to unrestricted use at termination of the activities in question. Appendix F of 10 CFR Part 50 states with respect to fuel reprocessing plants, for example, that "a design objective . . . shall be to facilitate decontamination and removal of all significant radioactive wastes at the time the facility is permanently decommissioned. Criteria for the extent of decontamination to be required upon decommissioning and license termination will be developed in consultation with competent groups." The Survey does not refer to any such criteria, and we are not aware that any have been promulgated by the Commission. Therefore, considerable uncertainty exists as to the realistic possibilities for overcoming the environmental damage caused to restricted areas and returning them to a benign condition.

Moreover, there have already been instances where effluents supposedly confined to restricted areas have penetrated the off-site environment. The most notable of these is of course the use of uranium mill tailings for construction in the Grand Junction area (see, *e.g.*, 37 Fed. Reg. 25918, Grand Junction Remedial Criteria). But in addition, radioactive material has been leached from tailings by rain water and entered the ground water system, resulting in excess downstream concentrations in the Colorado River. Windblown plutonium from wastes at the Rocky Flats weapons production facility likewise caused excessive off-site concentrations. These experiences bring into serious question the Survey's premise that effluent discharges in restricted areas are without environmental significance.

Violations of Effluent Standards

The Survey is ambiguous in many instances on whether discharges from fuel cycle facilities are or are not violating applicable standards. At S-26, fluoride concentrations of .005-2.0 micrograms/m ^{3} are said to "span the range of existing state standards," even though they apparently exceed the Washington State standard of 0.5 micrograms/m ^{3}. At S-28, enrichment plant liquid effluents are described as "generally within the range of permissible standards." This description could encompass any situation from occasional minor violations to frequent large-scale transgressions. At D-21, the Survey states with no further elaboration that an off-site SO_2 concentration of .025 ppm is "within the range" of EPA's annual mean standards of .02 ppm. In plain English, it exceeds the standard. Similar lapses of candor are present in other instances where the Survey encounters emissions which exceed the reference standards. (*E.g.*, B-15). Since the Survey consistently regards compliance with radiological and other standards as evidence of satisfactory environmental performance, the public is entitled to have a clear statement of those many instances where even this degree of assurance is absent.

Long-term Buildup of Krypton 85

The Survey states at the outset that it is unrealistic to express concentrations and dose rates in terms of the annual operation of the model LWR and that such radiological considerations will be expressed with reference to operations of the fuel cycle facilities themselves (S-11). In the important case of krypton 85, however, the Survey does not discuss long-term buildup in the atmosphere from the overall operations of the reprocessing plants, but only from the minor contribution attributable to the model LWR. (S-31, F-5). Thus the Survey does not

even provide the baseline data for a meaningful discussion of the problem, and no such discussion is found.

Respectfully submitted,

SIERRA CLUB

By John D. Hoffman
JOHN D. HOFFMAN
Sierra Club Legal Defense Fund, Inc.

ENVIRONMENTAL PROTECTION AGENCY
RADIATION OFFICE
Rockville, Maryland 20852

January 19, 1973

Secretary
U. S. Atomic Energy Commission
Washington, D. C. 20545

ATTN: Chief, Public Proceedings Branch

Dear Sir:

The AEC rulemaking proposal on amendment to 10 CFR Part 50, Appendix D, published in the *Federal Register* on November 15, 1972, which "would specifically deal with the question of consideration of environmental effects associated with the uranium fuel cycle in the individual cost-benefit analyses for light-water-cooled nuclear power reactors" has been reviewed. The EPA has expressed the intention to be a limited participant in the proposed hearing by memorandum to the AEC dated December 29, 1972. The comments offered below will be expanded by oral testimony at that time.

Ideally, we believe that in evaluating the environmental effects of the fuel cycle as related to a reactor, such effects, to the extent possible, should be related to the specific fuel cycle plants that support a given reactor. We recognize that at present and for the presently foreseeable future it would be impracticable to adopt such an approach because this kind of information is not available. Therefore, within the confines indicated below we are in agreement with the generic approach used by the AEC in its report, and believe the report provides an adequate consideration of the environmental effects of the present

uranium fuel cycle for purposes of the rulemaking. The AEC is to be commended for considering the total fuel cycle in evaluating the environmental aspects of light water reactors and should be encouraged to pursue this effort.

In view of the expected growth in nuclear power and the development of new and improved technology, we recommend that the AEC make it clear that it does not intend by this rulemaking action to foreclose future consideration of fuel cycle impact as related to reactors. This assurance can be given by stating in the rule that the environmental effect of the fuel cycle will be periodically evaluated and updated as new information is developed. We believe an effective period for the guidelines should be specified. We recommend a 2-year period in support of this position. One specific area that should be further examined is the disposition of high-level waste. While the concepts of dealing with such wastes have been developed, the detailed criteria being developed need to be evaluated in terms of environmental impact. Another specific area concerns radiological dose assessment. The AEC report considers average contribution of the total nuclear fuel cycle to the total environmental impact of a specific nuclear reactor. We believe that in the future as more data becomes available, estimates of regional impact should be made. In addition the control technologies for risk reduction and the procedures for evaluating the environmental impact of effluents are in a constant state of development as new techniques, methods, and information become available. This requires a periodic reexamination of the policies and procedures used for evaluation of the environmental impact of nuclear facilities. This problem of constantly evolving technology and the difficulty in quantifying the prorated impact of all fuel components, further supports our belief that periodic reassessment of the total environmental impact of the fuel cycle is essential.

Neither of the two alternatives proposed specifically address the problem of periodic review in a specified time period. As such, we feel they are unacceptable without modification. We recommend that Alternative 1 be adopted with the provision of periodic reassessment of fuel cycle input, the first period for reassessment being no longer than two years.

The EPA does not entirely concur with that section of Alternative 1 of the proposed rulemaking which states that ". . . since the environmental effects of those activities as related to a particular light-water-cooled nuclear power reactor have been analyzed in the Commission's *Environmental Survey of the Nuclear Fuel Cycle* and when factored into the cost-benefit analysis, are sufficiently small as not to affect significantly the resultant conclusion." We believe this to be a judgment factor which may change as additional information is developed. However, within the above-recommended limited effective period of the proposed rulemaking, we do agree that the committed environmental impact will be sufficiently small to justify such a statement. This recommendation in no way diminishes the responsibility of the EPA to set generally applicable environmental standards for the total uranium fuel cycle and for its components.

As an additional comment not related to the rulemaking, we feel that this approach of looking at the total uranium fuel cycle is typical of that required for the broader issues associated with electric power generation and we recommend that AEC undertake studies of other fuel cycles, including non-nuclear, so there will be a base for assessing and comparing the cost-benefit for all the cycles.

In summary, the EPA believes that a more detailed follow-on assessment of the potential environmental impact of the total nuclear fuel cycle should be actively pursued by the AEC. In the final analysis, any decisions on the environmental impact of the nuclear fuel cycle must take into consideration similar impacts of other fuel cycles in order to determine the electrical energy source mix most suitable for this nation. Also, efforts should be expanded to develop appropriate guidelines and standards applicable to components of the nuclear fuel cycle. More specific comments on the Commission's "*Environmental Survey of the Nuclear Fuel Cycle*" are enclosed.

Sincerely yours,

/s/ W. D. Rowe
W. D. Rowe
Deputy Assistant Administrator
for Radiation Programs

Enclosure

cc:
Mr. M. D. Paglin, Chairman
Dr. J. C. Geyer
Dr. M. J. Steindler
Atomic Safety & Licensing Board Panel, USAEC

SPECIFIC COMMENTS ON ENVIRONMENTAL SURVEY OF THE NUCLEAR FUEL CYCLE

A. RADIOLOGICAL ASPECTS

1. Discussion of waste disposal is not complete enough in that it indicates that potential environmental releases will be avoided by design

without indicating how or describing potential releases that will be designed against. The ultimate disposal of radioactive wastes produced as a result of nuclear power generation is a critical parameter in the evaluation of the total environmental impact of this energy system. Although an acceptable ultimate disposal methodology has not been determined, the criteria that will be utilized in deciding on such a methodology should be set forth in any complete fuel cycle evaluation. These criteria should indicate what present and future risks the AEC would consider justifiable in a cost-risk-benefit analysis. An evaluation should be made of the chances for developing a methodology to meet these criteria and what compromises would be considered. Other specific comments on the waste disposal evaluation are:

(a) It does not include the disposal of "other than high-level wastes" produced by the reactor operation.

(b) It presents insufficient discussion of fuel hulls.

(c) The model of the high-level interim storage facility is inadequate.

2. The discussion of accidents for all components should present probabilities associated with the various consequences.

3. Since the report does not consider the HTGR, a more descriptive title would be "Environmental Survey of the Light-Water Reactor Fuel Cycle."

4. There is a lack of a consistent format for expressing the radiological effects of the various components of the fuel cycle. For some of the

components, the effects are presented in terms of percentages of the 10 CFR 20 Appendix B limits at the site boundary; such is the case for milling, UF_6 production, uranium enrichment, and fuel fabrication. For the fuel reprocessing and transportation components, dose estimates are presented but not in a consistent format which will allow comparison of the various components of the fuel cycle. Some data on man-rem doses for fuel reprocessing and milling are presented in the Summary Table S-3, but no information on these doses is presented in the individual sections of the report devoted to these components of the fuel cycle.

It is suggested that the radiological effects of all of the various components of the fuel cycle be presented in terms of estimated man-rem dose to the population effected. It should also include information on doses to the maximum individual.

5. The information presented in Table S-3 on the discharges of radionuclides from milling and UF_6 production includes amounts of radionuclides discharged as liquids to on-site holding ponds. Since it is indicated that these radionuclides are not discharged to the uncontrolled environment, they should not be included in the effluent activity.

6. Table S-3 presented in the *Federal Register* of November 15, 1972 contains some values in the section under Radiological Effluents which are inconsistent with Table S-3 as presented in the *Environmental Survey of the Nuclear Fuel Cycle.* The liquid discharge of ^{234}Th and other uranium daughters are listed in the *Federal Register* as 0.001 curies and in the *Environmental Survey* as 0.01 curies. The tritium gaseous effluent in

the *Federal Register* is listed as 12 curies and in the *Environmental Survey* as 15.7 curies.

7. In the section under "Uranium Milling," it should be clearly stated how the AEC intends to regulate the stabilization and control of decommissioned uranium mill tailings ponds. A number of states with ongoing uranium milling activities do not have uranium mill tailings control regulations. The discussion presented in this section leaves the impression that no tailings control problems will exist under the present practices. The discussion in this section also indicates that tailing ponds are designed to prevent contamination of ground or surface water. This is definitely not the case for several of the mills located in EPA Region VIII (Colorado, Utah, Wyoming, and Montana). For instance, several mill ponds have been identified as leaching contaminants to the underlying strata containing ground water. Also, the Union Carbide Uranium Mill discharges on the average of 200 gpm of processed water effluent to the San Miguel River. This effluent contains over 10 g/1 of total dissolved solids which includes sulfate concentrations greater than 3.5 g/1.

8. In the section under "Fuel Fabrication" it would be appropriate to point out the differences in hazards of different chemical forms and enrichments of uranium. Soluble forms of uranium with less than 5% enrichment are a chemical hazard with the organ of interest being the kidney. All insoluble forms (UO_2 as an example) are a radiological hazard with the lung being the organ of interest. The above discussion is important in a public document since chemical toxicity is assumed to be a threshold effect and

radiological effects are assumed to be non-threshold.

9. The iodine removal efficiency of 99.9% for fuel reprocessing plants appears to be optimistic based on past experience. The values for iodine discharges and resultant doses should be qualified with a statement indicating that the removal technology is unproven.

10. Strontium-90 and cesium-137 were shown to be the most dosimetrically significant radionuclides in the liquid effluents at Nuclear Fuel Services. Although the new waste treatment facility should reduce the significance of these radionuclides in the liquid effluent, it would still be appropriate to discuss the quantities of these radionuclides to be discharged and their dosimetric significance.

11. The volumes of low-level solid waste generated at a fuel reprocessing plant are presented in Table F-6 based on estimates from the Barnwell Environmental Report. Would it not be more appropriate to use the actual information obtained from the Nuclear Fuel Services? At least an indication of the variability and the reasons for it should be stated. Also, the data presented in Table F-6 on Page F-27 has no units.

12. A figure of 10^{20} fissions for a criticality accident at a fuel reprocessing plant may be a more conservative value than the 10^{18} fissions used in this report. The Midwest Fuel Recovery Plant uses a value of 10^{20} in their PSAR. Also, an accident at ICPP is reported to have exceeded 10^{18} fissions.

13. The Barnwell Environmental Impact Statement estimated 8 rail accidents per 10^6 train miles. A value of 0.8 accidents per 10^6 rail miles was

used in this report. The discrepancy should be resolved.

14. The dose to bone from the transuranic elements appears to be expressed as a yearly dose. It would be better expressed as a 50 year dose commitment resulting from an annual release.

15. The safeguard issue should be considered under the transportation section. A discussion of the procedures to be used for protecting the shipments against highjacking would appear to be appropriate as well as an evaluation of the possible consequences of a highjacking.

B. AIR QUALITY ASPECTS

1. In general we find the subject document to be a relatively complete overview of the non-radioactive air quality aspects of the nuclear fuel cycle. It seems likely that some of the non-radioactive air pollution emission estimates are a little on the low side. However, without more precise information about the type and size of equipment, fuel specifications and quantities to be used at the various facilities discussed, these estimates appear to be as good as any others would be.

2. A discussion of measures to be implemented for the control of evaporative hydrocarbons from bulk fuel storage at any of these facilities should be provided.

3. Oxides of nitrogen should be added to the list of combustion products of petroleum used to fuel the heavy earth moving equipment discussed on page A-16. Furthermore, some quantitative estimates of the emission levels should be provided.

4. The small quantities of sulfuric acid fumes, kerosene and dust mentioned on pages B-5 and B-14 should be quantified.

5. The 0.025 ppm off-site concentration of SO_2 (page D-21) is within the current Primary Ambient Air Standard; however, some additional SO_2 control will have to be installed to meet the Secondary Standard when they eventually become mandatory.

6. Some discussion of methods utilized to control dust should be provided in the section considering radioactive waste management.

C. WATER QUALITY ASPECTS

1. EPA does not believe that effluent dilution is an acceptable method of effluent control. There are several references in this report to the dilution of waste effluent streams prior to discharge to the environment. It is not clear as to whether this is a control mechanism or merely a statement of practice. Additional information on the methods of effluent control is necessary to determine if the procedures being used are acceptable.

2. The discussion of "accident consideration" relating to the milling operation, it is not clear whether the 5-foot minimum free board requirement takes into consideration flash flooding which is common to that geographical area.

3. The sections on accident considerations should discuss in greater detail the contamination of waterways resulting from potential accidents. For example, in the section under "uranium hexafluoride production," it is stated that a dike

failure would result in a significant environmental insult. More information on this effect should be presented.

4. The section on uranium enrichment should contain a discussion of the proposed water supply which would be used for a large scale uranium enrichment plant. This consideration should be carefully explored since it represents the "maximum case" for water natural resource utilization.

5. The section on the "overview of the total nuclear fuel cycle" should include a discussion of the future total water requirement.

6. More information is required on mixing zones, steam characteristics, etc. with respect to thermal discharges. The maximum temperature of any river should not be above 90° F for warm water fisheries. A 50° F rise in a trout stream may be a lethal load.

7. The Water Quality Criteria presented in Table D-8 may be changed within a short period of time to more restrictive values.

UNITED STATES DEPARTMENT
OF THE INTERIOR
OFFICE OF THE SECRETARY
Washington, D.C. 20240

February 23, 1973

ER-72/1437

Dear Mr. Secretary:

This is in response to Mr. Smiley's letter of November 21, 1972, inviting our comments on the Atomic Energy Commission's report entitled "Environmental Survey of the Nuclear Fuel Cycle," dated November 1972.

We are pleased that the AEC has published this Environmental Survey of the Nuclear Fuel Cycle. Much of the data given in this report is needed to supplement information normally given in environmental statements for individual nuclear reactors. However, since the report must cover such a wide spectrum to supply the information lacking in the individual environmental evaluations, we believe that the November 1972 issue should be significantly enlarged and modified if it is to fill the present need.

General

The discussion of the effects on the environment are in most instances very general in this report. We recognize that separate environmental statements on individual operations go into greater detail.

There is an implication throughout the document that the "environment" begins and ends at the site boundary of any nuclear facility; hence, any release will have no environmental effect if it is confined within the site boundary.

There are a vast number of retention ponds, settlement basins, and tailing ponds described throughout the report,

the construction of which do not appear to be limited to any engineering standards. These various impoundments contain large volumes of fluids and particulate matter of various degrees of activity and toxicity. The history of failures of such facilities is vast and many have resulted in widespread and significant environmental damage. The assumption is made for several operations that chemical or radioactive wastes buried or held in retention ponds will not give rise to effluents and will have no environmental effects. We do not think that this assumption is generally acceptable. Long-term action of ground and surface water on these wastes should be considered and evaluated before such an assumption is made.

Although the release of radionuclides is closely controlled as to concentration, much of this control is exercised by dilution in the medium to which they are released; hence, appreciable quantities may be released, albeit, in low concentrations. This rationale does not give consideration for the possibility that reconcentration of these radionuclides can take place within the natural systems to which they are released.

The report also appears to omit the consideration of some operations which are part of the fuel cycle. Among these are the solidification of high-level wastes, cleanup operations after accidents involving radioactive materials, and eventual disposal of major contaminated components of facilities.

The solidification of liquid high-level wastes, while not presently operational, will soon be a required step in the fuel cycle. It would appear that the subject report should include consideration of potential wastes or accidents involved in this operation.

Accidents at nuclear facilities, including reactors, are likely to produce radioactive liquids or solids that must

be further treated or stored. Cleanup operations inside or outside the plants and those associated with mining operations involve cleanup operations as well as disposal of damaged or contaminated facilities. The report should consider the quantities of contaminated materials that might be involved and the effects of their disposal.

We think the report should also consider the effects of the eventual disposal of contaminated facilities and major components after the end of their useful life. Such consideration for elements such as reactor components would be included since the effects of decommissioning are not usually evaluated in the environmental statements issued for individual reactors.

The report also deals with the disposition of high-level radioactive wastes and purified plutonium but does not describe the enormous potential for damage to the environment that is inherent in these materials. Without discussion of the nature of these dangers, it is not possible to evaluate the adequacy of the procedures intended to avoid them. Since these dangers are not usually discussed in environmental statements on individual operations of nuclear reactors, any overall coverage, such as appears to have been the intent of this report, should be thorough and detailed.

This survey report uses average statistics based on the present production situation. Since much of this production is committed to meeting existing uranium needs, we think that it would be more realistic to project the production cycle based on the life of future new plants.

Throughout the document, reference is made to land used for a particular phase of the nuclear fuel cycle as temporary. Since much of the lands used in the nuclear fuel cycle requires fencing or considerable elapsed time before it can be rehabilitated, we believe that the use of the term "temporary" is misleading. We suggest that such lands

be labeled as "restricted for future use." Also, a better assessment would be made if the area of such lands were totaled and shown in the report according to the level of restrictive use and length of time involved.

Our detailed comments are presented according to the format of the report.

Summary

Figure S-1, on page S-3, indicates that 4.6 acres of land is permanently committed annually per 1,000 MW plant. This assumes revegetation of the spoils and backfilling much of the pit. Industry's record does not substantiate this assumption. A more realistic figure is much greater than 4.6 acres as indicated in our general comments.

Uranium Mining

The indication on page A-15 that the bulk of the water pumped from the mines is recycled and returned to the groundwater from which it came is questionable. The common practice is to divert the pumped water to the nearest surface drainage. Some infiltration to groundwater may occur but usually at some point further downstream.

Mine dewatering may or may not have significant effects, but there is no evidence in the report that an effort was made to evaluate such effects.

This section ignores prospecting and exploration stages of the mining operation. These operations would affect much larger areas than the actual mining although to a smaller degree.

Industrial accidents and health hazards are not considered. This factor would be significant in the underground mining such as the Grants District in New Mexico. In open-pit mines, radon is usually not a problem; however,

radioactive dust may adversely affect the health of the employees involved with the mining.

If a mill is associated with the mine, some of the water pumped from the workings may be used in the milling process. However, regardless of whether this is the case, the waste water (often containing low levels of radioactivity and acids) is usually discharged into the nearest dry wash from which it eventually seeps into the ground. We think that the depths at which the water looses the radioactive content, including daughter products, should be given along with the effects of the radioactivity on the environment.

Since most uranium mining is on private land or mining claims of Federal land, it is subject only to State laws and the operator's actions. Performance in the past has been poor although there is evidence of improvement. We understand that efforts are being made to slope and revegetate spoil-piles in the Shirley Basin area in Wyoming but do not know of any similar plans for the Gas Hills area, Wyoming, or the open pit operations in the Four Corners area. Any AEC regulations and the method of enforcement should be discussed in regard to mining operations.

Uranium Milling

The first paragraph on page B-17 includes a brief discussion of the liquid effluent from the mill but does not discuss the quantities of chemicals discharged to tailing ponds and their effect on surface and groundwater for the long term.

Although the concentrations of airbourne radioactive effluents released into the environment from processing operations are limited, the effects of the deposition of airbourne radium-226, thorium-230, and other longlived radionuclides near the mill should be evaluated.

The storage of liquid and solid wastes in the retention ponds will lead to an accummulation of alpha-emitting radionuclides amounting to more than 6,300 curies. The report indicates that wells are used to monitor groundwater contamination. Although we are not advocating the discontinuance of well monitoring, we think that it is doubtful that wells can do more than detect contamination after it has occurred. Due to the longlived nature of these radionuclides, this contamination could persist for long periods of time and eventually some of the stored radionuclides would enter the groundwater or be flushed downstream by flood waters. We think the report should have evaluated the extent of contamination that has a reasonable possibility of occurrence.

The effects of a catastrophic failure of the low-head dam holding the tailings are discussed on page B-23. The volume of tailings and the magnitude of impacts resulting from the break of the dam should be indicated.

Uranium Hexafluoride Production

We do not think that the chemical and radiochemical composition and annual quantity of the raffinate are adequately defined. The quantity and composition of the sludges in the raffinate retention ponds and their eventual fate should also be described.

Uranium Enrichment

According to pages D-24 and D-25, sludges from holding ponds are buried on site. We think that the composition of these sludges and the potential effects on groundwater should also be described.

Fuel Fabrication

According to the second paragraph on page E-24, the calcium fluoride precipitate is buried at the fuel fabrication plant site. The potential effects on groundwater should have been considered.

Irradiated Fuel Reprocessing

It is stated on pages F-26 and F-27 that solid wastes containing fission products, uranium, and plutonium will be stored or buried onsite in recoverable form or may be shipped to a Federal repository. The total quantities of radionuclides should be estimated and potential effects on groundwater of onsite burial should have been considered.

Radioactive Waste Management

It is indicated on page G-3 that no effluents to the offsite environment are expected to result from burial of waste classified as "other than high level." It would appear that the specific criteria and safeguards which will be used should also be described in the report.

Burial-site suitability is said to depend on factors assuring that there will be no migration of radionuclides from the site. Ultimately, migration cannot be avoided. The level of significance depends on the physical and chemical character and longevity of the wastes as well as on geologic and hydrologic conditions. The report should have considered the waste characteristics and quantities in evaluating potential effects.

Since some existing burial facilities are located in Illinois, Kentucky, South Carolina, and New York and are exposed to a generally humid climate; it does not appear that the description of the model facility given on page G-12 is realistic. Periods of intense precipitation causing flooding to any exposed trenches are likely to occur in all of these States.

We hope these comments will be helpful to you.

Sincerely yours,

/s/ [Illegible]
Deputy Assistant Secretary
of the Interior

Secretary Paul C. Bender
U.S. Atomic Energy Commission
Washington, D. C. 20545

ADMINISTRATIVE CONFERENCE OF THE
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OFFICE OF
THE CHAIRMAN

RECOMMENDATION NO. 76-3: PROCEDURES IN ADDITION TO NOTICE AND THE OPPORTUNITY FOR COMMENT IN INFORMAL RULEMAKING.

(Adopted June 3-4, 1976)

The Conference's Recommendation 72-5 stated that in rulemaking of general applicability involving substantive rules "Congress ordinarily should not impose mandatory procedural requirements other than those required by 5 U.S.C. § 553," and that "Congress should never require trial-type procedures for resolving questions of policy or of broad or general fact." Paragraph 5 of the Recommendation recognized that agencies nevertheless may sometimes appropriately utilize such procedures for resolving issues of specific fact, and it counseled that in rulemaking proceedings of general applicability "each agency should decide in the light of the circumstances of particular proceedings whether or not to provide procedural protections going beyond" the notice-and-comment requirements of Section 553, "such as opportunity for oral argument, agency consultation with an advisory committee, opportunity for parties to comment on each other's written or oral submissions, a public-meeting type of hearing, or trial-type hearing for issues of specific fact."

The present Recommendation enlarges upon paragraph 5 of Recommendation 72-5 by further specifying for agency consideration certain procedures going beyond

notice-and-comment, and by describing some of the "circumstances of particular proceedings" that should move agencies to consider such additional procedures.

The Recommendation grows out of a study of decisions, primarily of the Court of Appeals for the District of Columbia Circuit, in which rulemaking proceedings have been remanded to agencies for additional procedures, and of the responses of the affected agencies. The Recommendation implies no view as to whether those decisions were authorized by the Constitution or relevant statutes. The Recommendation is premised, however, on the view that one can learn from the insights of judges, who on the basis of their study of records reflecting "the circumstances of particular proceedings," perceived a need for procedures in addition to notice and the opportunity for comment, and from the experience of agencies required to provide such additional procedures.

Recommendation

1. Agencies should afford interested persons the opportunity to participate as effectively as possible in notice-and-comment rulemaking proceedings. Therefore, in order to enlarge the opportunity for public participation and increase its effectiveness, agencies in appropriate circumstances should utilize procedures such as the following, which go beyond a single notice and opportunity to comment and supplement or particularize those listed as examples in Recommendation 72-5.[1]

a. Providing from the outset for the possibility of two cycles of notice-and-comment (i) when the agency anticipates that the issues raised by the rulemaking will be

[1] This Recommendation is addressed solely to agency process *prior* to the final promulgation of a rule. In addition, the agency statement of the basis and purpose of the rule incorporated in the rule when it adopted should be clear and complete and should fully and fairly inform the public as to the basis and purpose of the rule.

unusually complex, or (ii) when it is in the public interest to utilize the initial notice of proposed rulemaking to give only a general description of the subjects and issues involved in the proceeding and to invite public comment upon those subjects and issues; provided that at the conclusion of the first cycle the agency may take any action within its powers. In addition an agency may at any time announce, as by an "advance notice of proposed rulemaking," that it intends to issue a notice of rulemaking, and in such announcement solicit comments and suggestions with respect to the contents of such notice.

b. Providing for a second cycle of notice-and-comment or by notice providing an opportunity for additional comment in any proceeding when comments filed in the proceeding, or the agency's response to such comments, present new and important issues or serious conflicts of data. An agency should consider the desirability of responding to comments as a means of exposing the agency's tentative views in order to enhance the usefulness of further comments by the public.

c. Incorporating in the notice of notice-and-comment cycle a summation of the agency's current attitudes toward critical issues in the proceeding and a description of the data on which the agency relies, indicating where the data may be inspected.

d. Providing an explanation of the tests and other procedures followed by the agency and the significance the agency has attached to them, and allowing opportunity for comment thereon.[2]

e. Holding conferences open to the public, on adequate notice, when an opportunity for all interested

[2] This may be accomplished, for example, in a public notice or by technical reports issued or relied upon by the agency and incorporated by reference in the proceeding.

groups (such as agency staff, directly affected persons, agency policy-makers and public interest groups) to question one another would be effective in resolving, narrowing or clarifying the disputed issues.

f. Hearing argument and other oral presentation, when the presiding agency official or officials may ask questions, including questions submitted by interested persons.

Important circumstances tending to suggest the desirability of using such procedural devices are that (1) the scientific, technical or other data relevant to the proposed rule are complex; (2) the problem posed is so open-ended that an agency may profit from receiving diverse public views before publishing a proposed rule for final comment; and (3) the costs that errors in the rule may impose, including health, welfare and environmental losses imposed on the public and pecuniary expenses imposed on the affected industries and consumers of their products, are significant.

2. In rulemaking proceedings subject to notice-and-comment requirements agencies should give interested persons an opportunity to indicate issues of specific fact as to which they contend that cross-examination should be considered by the agency to be appropriate. Cross-examination, where permitted, should be strictly limited as to subject and duration.

3. An agency should employ any of the devices specified in paragraph 1 or permit cross-examination only to the extent that it believes that the anticipated costs (including those related to increasing the time involved and the deployment of additional agency resources) are offset by anticipated gains in the quality of the rule and in the extent to which the rulemaking procedure will be perceived as having been fair.

FOR IMMEDIATE RELEASE APRIL 7, 1977

OFFICE OF THE
WHITE HOUSE PRESS SECRETARY

THE WHITE HOUSE
REMARKS OF THE PRESIDENT
ON NUCLEAR POWER POLICY
AND
QUESTION AND ANSWER SESSION

THE BRIEFING ROOM
[TRANSCRIPT]

11:20 A.M. EST

THE PRESIDENT: Good morning, everybody.

I have two items to discuss with you this morning, and then I would like to answer a few questions.

One relates to the economy and the need for continuing emphasis on the stimulation package. Based on the best information available to us now, we will have an accumulated spending shortfall for this current fiscal year, fiscal year 1977, plus revenue collections in excess of the anticipated amount of about $10 billion. In other words, we have collected about $10 billion more from the American taxpayers than we anticipate spending in 1977.

I feel very strongly that this money should go back to the American taxpayers. We need it for the economy to maintain its present strength and the only equitable way that I see is through the already-prepared tax refund which would average about $50 per person which, as I have said before, would be about 30 percent of the 1976 income taxes paid by a family making about $10,000 a year.

The second point I would like to make before I answer questions is concerning our Nation's effort to control the spread of a nuclear explosive capability. As far back as 30 years ago, our Government made a proposal to the United Nations that there would be tight international controls over nuclear fuels and particularly those that might be made into explosives.

Last year during the Presidential campaign, both I and President Ford called for strict controls over fuels to prevent the proliferation, further proliferation, of nuclear explosive capability.

There is no dilemma today more difficult to address than that connected with the use of atomic power. Many countries see atomic power as their only real opportunity to deal with the dwindling supplies of oil, the increasing price of oil and the ultimate exhaustion of both oil and natural gas.

Our country is in a little better position. We have oil supplies of our own and we have very large reserves of coal. But even coal has its limitations, so we will ourselves continue to use atomic power as a share of our total energy production.

The benefits of nuclear power, particularly to some foreign countries that don't have oil and coal of their own, are very practical and critical. But a serious risk is involved in the handling of nuclear fuels—the risk that component parts of this power process will be turned to providing explosives or atomic weapons.

We took an important step in reducing this risk a number of years ago by the implementation of the nonproliferation treaty which has now been signed by approximately 100 nations. But we must go further.

We have seen recently India evolve an explosive device derived from a peaceful nuclear power plant, and we now

feel that several other nations are on the verge of becoming nuclear explosive powers.

The United States is deeply concerned about the consequences of the uncontrolled spread of this nuclear weapon capability. We can't arrest it immediately and unilaterally. We have no authority over other countries. But we believe these risks would be vastly increased by the further spread of reprocessing capabilities of the spent nuclear fuel from which explosives can be derived.

Plutonium is specially poisonous and, of course, enriched uranium, thorium and other chemicals of metals can be used as well.

We are now completing an extremely thorough review of our own nuclear power program. We have concluded that serious consequences can be derived from our own laxity in the handling of these materials and the spread of their use by other countries, and we believe that there is strong scientific and economic evidence that a time for a change has come.

Therefore, we will make a major change in the United States domestic nuclear energy policies and programs which I am announcing today.

We will make a concerted effort among all other countries to find better answers to the problems and risks of nuclear proliferation, and I would like to outline a few things now that we will do specifically.

First of all, we will defer indefinitely the commercial reprocessing and recycling of the plutonium produced in U. S. nuclear power programs.

From my own experience, we have concluded that a viable and adequate economic nuclear program can be maintained without such reprocessing and recycling of plutonium. The plant at Barnwell, South Carolina, for

instance, will receive neither Federal encouragement nor funding from us for its completion as a reprocessing facility.

Second, we will restructure our own U. S. breeder program to give greater priority to alternative designs of the breeder other than plutonium, and to defer the date when breeder reactors would be put into commercial use.

We will continue research and development, but shift away from plutonium, defer dependence on the breeder reactor for commercial use.

Third, we will direct funding of U. S. nuclear research and development programs to accelerate our research into alternative nuclear fuel cycles which do not involve direct access to materials that can be used for nuclear weapons.

Fourth, we will increase the U. S. capacity to produce nuclear fuels, enriched uranium in particular, to provide adequate and timely supplies of nuclear fuels to countries that need them, so that they will not be required or encouraged to reprocess their own materials.

Fifth, we will propose to the Congress the necessary legislative steps to permit us to sign these supply contracts and remove the pressure for the reprocessing of nuclear fuels by other countries that do not now have this capability.

Sixth, we will continue to embargo the export of either equipment or technology that could permit uranium enrichment and chemical reprocessing.

And seventh, we will continue discussions with supplying countries and recipient countries, as well, of a wide range of international approaches and frameworks that will permit all countries to achieve their own energy needs while at the same time reducing the spread of the capabilities for nuclear explosive development.

Among other things, we have discussed this with fifteen or twenty national leaders already; we will explore the establishment of an international nuclear fuel cycle evaluation program so that we can share with countries that have to reprocess nuclear fuel the responsibility for curtailing the ability for the development of explosives.

One other point that ought to be made in the international negotiation field is that we have to help provide some means for the storage of spent nuclear fuel materials which are highly explosive, highly radioactive in nature.

I have been working very closely with, and personally, with some of the foreign leaders who are quite deeply involved in the decisions that we make. We are not trying to impose our will on those nations like Japan, France, Britain and Germany, which already have reprocessing plants in operation.

They have a special need that we don't have in that their supplies of petroleum products are not available. But we hope that they will join with us, and I believe that they will, in trying to have some worldwide understanding of the extreme threat of the further proliferation of nuclear explosive capability.

FOR ARGUMENT

Supreme Court, U. S.
FILED
NOV 19 1977
MICHAEL RODAK, JR., CLERK

Nos. 76-419 and 76-528

In the Supreme Court of the United States

OCTOBER TERM, 1977

VERMONT YANKEE NUCLEAR POWER CORPORATION, PETITIONER

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.

CONSUMERS POWER COMPANY, PETITIONER

v.

NELSON AESCHLIMAN, ET AL.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

REPLY BRIEF FOR THE FEDERAL RESPONDENTS

WADE H. MCCREE, JR.,
Solicitor General,
Department of Justice,
Washington, D.C. 20530.

In the Supreme Court of the United States

OCTOBER TERM, 1977

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION, PETITIONER

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1. Respondent Natural Resources Defense Council (NRDC) in No. 76-419 contends (Br. 10, 27, 47) that the Commission's choice of procedures in its rulemaking leading to promulgation of Table S-3 was an unjustified departure from settled agency practice. But by far the majority of Commission rulemakings, including those involving generic environmental and safety issues, have

been conducted simply by notice-and-comment procedures. Only two of the Commission's many rulemakings involved hearings at which questioning by participants and limited discovery were allowed.[1]

More than 20 significant Commission rulemaking determinations relating to the Commission's power plant licensing and environmental protection regulations (10 C.F.R. Parts 50 and 51) have been made on the basis of notice and comment procedures since 1970. Several of these informal rulemakings involved matters of substantial safety and environmental importance, including "Quality Assurance Criteria for Nuclear Power Plants," 35 Fed. Reg. 10498, "General Design Criteria for Nuclear Power Plants," 36 Fed. Reg. 3255, "Pre-Construction Permit Activities," 39 Fed. Reg. 14506, and "Environmental Protection—Licensing and Regulatory Policy and Procedures," 39 Fed. Reg. 26279. Informal rulemaking is the method that the Commission has typically chosen for treating generic environmental and safety questions. Thus, the degree of public participation provided by the uranium fuel cycle hearing is noteworthy as an enlargement, rather than a construction, of the procedural rights routinely afforded in Commission rulemaking.[2]

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[1]These two rulemakings are cited by NRDC as typical (Br. 49, n. 69). NRDC cites as a further example the proceedings on the "Generic Environmental Statement on Mixed Oxide Fuel" ("GESMO"), currently in abeyance (*ibid.*). But the GESMO procedures were not established until January 6, 1976 (41 Fed. Reg. 1133) and cannot be held up as an example of "settled agency practice" at the time of the 1973 fuel cycle hearing. In any event, the Commission has explicitly noted that the particular issues in the GESMO proceeding justified a departure from the usual procedures (41 Fed. Reg. 50834).

[2]The Brief for the Non-Federal Respondents in No. 76-528 (p. 25) and the Brief *Amicus Curiae* for 24 Named States (pp. 8-9, n. 13) suggest that changes in administration policy on plutonium fuel recycling require reconsideration of Table S-3. But the revised environmental survey previously lodged with this Court has already evaluated uranium fuel cycle impacts in the absence of plutonium recycling. "In the survey the light water power reactor uranium fuel cycle was taken as including alternatively (1) no reprocessing of spent fuel and follow-on interim and or long-term storage or disposal of spent fuel or (2) reprocessing spent fuel for purposes other than recycle of plutonium * * *" (42 Fed. Reg. 34393).

2. The Brief for the Non-Federal Respondents in No. 76-528 ("Aeschliman Brief") asserts (pp. 7-9, 34-35) that the Commission had agreed, long before it made the decisions reviewed by the court of appeals below, that energy conservation was an alternative to the construction of nuclear power plants that had to be considered in environmental impact statements. This is not the case.

While the Commission was aware in 1971 and 1972 that traditional ideas about meeting energy demands were being questioned in various forums, there is no indication that those questions had yet suggested arguably practical alternatives to nuclear power plants. The quotations purporting to show the contrary are inaccurate or are taken out of context.

For example, the Aeschliman Brief implies (p. 8) that the Commission, the Council on Environmental Quality and the Environmental Protection Agency agreed at Senate hearings in 1972 that the NEPA required consideration of the use of energy conservation to reduce the projected power needs, citing Joint Hearings on the Operation of the National Environmental Policy Act of 1969 before the Senate Committees on Public Works and Internal and Insular Affairs, 92d Cong., 2d Sess. 405-409 (1972) (hereafter "Joint Hearings").

But these hearings contain no mention of energy conservation. Indeed, the statement of EPA Administrator William D. Ruckelshaus suggests that agencies such as the

Commission were *not* required by the NEPA to consider alternatives, such as energy conservation, that they did not have the authority to implement, and that were not within their area of expertise.[3] Instead, CEQ, EPA and the Commission simply stated, in effect, that the NEPA requires consideration in an environmental impact statement of "no action" as one alternative to a proposed agency action, and that the range of alternatives to be investigated is not bounded by the agency's jurisdiction.

Similarly, the Aeschliman Brief states (pp. 7-8); that

> In March, 1972 * * * the Commission told Congress that AEC Licensing Boards had the "authority and responsibility" to consider every aspect of a NEPA cost-benefit analysis, including "the rationing or limiting the use of electricity as an alternative to building a particular nuclear power plant * * *."

This summary distorts the record. The quoted language is taken in part from a question posed by Senator Jackson in a letter to the Commission; the entire exchange is

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[3]Mr. Ruckelshaus stated (Joint Hearings, *supra*, at 405):

> I believe that an agency may consider alternatives that are outside of its own authority to implement. * * * The question of whether an agency must consider and discuss such alternatives is much more difficult. The basic problem here is that federal agencies are by definition fully knowledgeable only in the areas within their statutory mandates, and for the [sic] reason they cannot be expected to be able to perceive and discuss alternative courses of action that might be either within the power of another federal agency or available only from hypothetical legislation in another field. There is no question that in enacting NEPA Congress intended that every federal agency acquaint itself with, and take account of, the environmental effects of its activities, but I do not think that in so doing Congress also required each agency to become familiar enough with the substantive aspects of other existing or possible programs to be able to comment on steps that might be taken in that regard.

quoted below.[4] It shows that the Commission replied to the Senator's question concerning the extent of the Licensing Board's authority by stating that in considering the need for power, the Board relied on the Federal Power Commission's assessment; "the Board's responsibility is one of establishing the fact that there has been sufficient evidence produced as to the need for power (as evidenced by the FPC's evaluation and report)." Hearing on the Calvert Cliffs Court Decision before the Senate Committee on Interior and Insular Affairs, 92d Cong., 1st Sess., Part 2, 406 (1971).

The Aeschliman Brief also states (p. 7) that the Chairman of the Commission said in October 1971 that

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[4]The entire question and answer read as follows (Hearing on the Calvert Cliffs Court Decision before the Senate Committee on Interior and Insular Affairs, 92d Cong., 1st Sess., Part 2, 406 (1971); italics omitted):

> Question 16: Reportedly, the Atomic Safety and Licensing Boards are provided final environmental impact statements as well as agency comments. In evaluating the cost-benefit analysis for a given nuclear power plant does the Board have the flexibility to consider the implications of the rationing or limiting the use of electricity as an alternative to building a particular nuclear power plant?
>
> Answer: The Atomic Safety and Licensing Boards have the authority and responsibility to consider all aspects of the cost-benefit analysis for a given nuclear power plant. This would also include consideration of Environmental Reports submitted by applicants for construction permits and AEC Detailed Environmental Statements where the need for power is discussed.
>
> As Commissioner Doub indicated in his testimony, the FPC is the primary agency concerned with power supply and reliability and the AEC relies on FPC comments and independent assessment of power supply needs in affected areas in connection with each Environmental Statement prepared for a nuclear power plant. The Board's responsibility is one of establishing the fact that there has been sufficient evidence produced as to the need for power (as evidenced by the FPC's evaluation and report).

"energy conservation was a 'legitimate' and 'not unreasonable' issue," and that "long before the *Midland* environmental hearings the Commission acknowledged that 'the desirability and the means of limiting * * * [demand] growth are being debated today.' " In fact, the Commission's Chairman stated that while others had raised "a legitimate social question" whether the society "ought not curb its appetite for energy and for electric power," it would be "inappropriate for the [AEC] to take a position on this issue. The AEC should be officially neutral." Joint Committee on Atomic Energy, Selected Materials on the Calvert Cliffs Decision, its Origin and Aftermath, 92d Cong., 1st Sess. 392, 397 (1972).[5] In addition, while the Commission's staff acknowledged the existence of a debate over the growth of the demand for electric power, it did not expect that debate to influence actual demand in the near future.[6]

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[5]The Chairman stated in pertinent part (*id.* at 397):

> Environmentalists have also been raising questions that transcend the issues involved in individual plants. The question has been raised, by Michael McCloskey of the Sierra Club among others, whether our society for environmental reasons viewed broadly ought not curb its appetite for energy and for electric power. It is a legitimate social question. It is not unreasonable to question whether neon signs or even airconditioning are essential ingredients in the American way of life. More fundamentally it is not unthinkable to inquire whether energy production should be determined solely in response to market demand. * * *
>
> Whatever the private views of the Commissioners, it would seem to me inappropriate for the Atomic Energy Commission to take a position on this issue. The AEC should be officially neutral. It is the AEC's mission to provide energy options that will serve public needs—in whatever manner the public prescribes those needs. The AEC lacks authority and consequently should avoid becoming entangled in the determination of broad social issues of this type.

[6]A 1971 Commission draft environmental impact statement discussed Federal Power Commission estimates of probable electrical load growth in the area served by a utility proposing to build a nuclear plant. It then stated that:

> This growth reflects both increasing population and increasing *per capita* consumption of electricity. Although the desirability and the means of limiting both types of growth are being debated today, there is no reason to expect the power demands during the next several years to deviate significantly from the Federal Power Commission predictions.

U.S. Atomic Energy Commission, Division of Radiological and Environmental Protection, Draft Detailed Statement on the Environmental Considerations Related to the Proposed Issuance of an Operating License to the Duke Power Company for the Oconee Nuclear Station, Unit 1, Docket No. 50-269 at 1 (December 13, 1971), reprinted in Joint Hearings, *supra*, at 190, 202.

In sum, the materials cited in the Aeschliman Brief do not suggest that the Commission recognized the need to consider the effects of energy conservation at the time of the Midland hearings. They indicate at most that the Commission was aware in 1971 and 1972 of the beginning debate over broad questions of energy policy, but that the concept of energy conservation was not at that time a recognized alternative to power plant construction. Accordingly, the NEPA did not require the discussion of that alternative in environmental impact statements at that time.

3. The Aeschliman Brief, relying on the record made after the court of appeals' decision, also asserts (pp. 20-21) that the Commission's staff still does not understand the "other problems related to large water reactors" mentioned by the Commission's Advisory Committee on Reactor Safeguards (ACRS) (see Gov't Brief 18). Respondents further contend that the uncertainty concerning when these problems will be resolved raises a serious question about the safety of the Midland reactors (Aeschliman Brief 21). Both arguments are incorrect.

a. The staff understood quite well just what the ACRS' "other problems" were. The staff has for many years discussed these generic issues with the ACRS during the review of proposed nuclear projects and related technology; the staff is generally familiar with the ACRS concerns (see, *e.g.*, staff testimony at Supp. R. 4171-4173).[7] Since 1972, the ACRS has issued lists of generic problems—the "other problems" referred to in the Midland report and ACRS reports on other reactors (see Gov't Brief 71-72). Indeed, the staff has been responsible for development of much of the technical information that has ultimately formed the basis for the resolution of many of the ACRS' generic concerns. The staff has also recently established a more formal, systematic program for the resolution of generic technical issues, and the ACRS' generic items have been specifically considered in this program (see letters from Edson G. Case, Acting Director of the Commission's Office of Nuclear Reactor Regulation, to Myer Bender, Chairman, ACRS, October 19, 1977 and October 25, 1977). Additionally, the testimony at the remand hearing makes clear that the staff was aware of the ACRS' generic concerns. In response to the court of appeals mandate, the ACRS wrote a November 18, 1976 "Supplemental Report" on the Midland Plant (Gov't Ex. 1, Supp. R. 1372, 4183). The staff's written direct testimony includes a detailed discussion of the nature and status of each of the 11 items listed in the Supplemental Report (following Supp. R. 4177, entitled *Draft Analysis of ACRS Report of 11/18/76*). Six items and part of a seventh were considered resolved by the time that testimony was written.

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[7]"Supp. R." refers to the transcript on remand after the court of appeals' decision.

b. The existence of the "other problems" referred to in the ACRS letter does not indicate that significant safety questions were overlooked in issuing the Midland construction permit (see Aeschliman Brief 28-29). The ACRS letters in this case reported the Committee's conclusion that issuance of a construction permit for the Midland reactors was consistent with the public health and safety (R. 2615-2616; Gov't Brief 18). The reference to "other problems related to large water reactors" did not suggest that the proposed plant should not be licensed, but rather reflected the ACRS' judgment that certain unresolved issues deserve the staff's serious and continued attention (Supp. R. 4200-4222). As staff testimony amply indicates, the ACRS does not expect that all these problems will be solved during construction. What is expected is that "due consideration"—resolution of some and a good faith effort to solve others—will be given to these problems (Supp. R. 4214-4218). The degree of resolution considered appropriate for a particular generic issue is a matter of informed judgment (Supp. R. 4218-4222).[8] In no event may a plant begin operation unless the problems have been resolved to the extent that there is "an adequate level of safety at the plant" although some problems remain unresolved (Supp. R. 4221). Cf. *Power Reactor Co.* v. *Electricians*, 367 U.S. 396, 404-410.

---

[8]The degree of resolution considered appropriate for a particular item depends on a number of factors, among them the specific design of the particular plant, the safety significance of the particular item with respect to the type of plant involved, the state of related technology, and the impact of the item on other safety-related features and plant performance. The decision to permit a specific item to remain unresolved is also based on the judgment that when solutions are found there will be adequate opportunity to consider whether their implementation in plants under construction and in operation should be required as an additional safety measure.

In sum, efforts to resolve generic problems are expected to receive serious and continued consideration. The construction or operation of a power plant may be licensed despite the existence of unresolved generic problems only when the Commission concludes that the public safety will not be compromised by the issuance of the license.

CONCLUSION

For the foregoing reasons and those stated in our principal brief, the judgment of the court of appeals in No. 76-419 should be reversed, and the judgment in No. 76-528 should be reversed insofar as it remands the orders granting construction permits for the Midland reactors to the Commission for further proceedings.

Respectfully submitted.

WADE H. MCCREE, JR.,
Solicitor General.

NOVEMBER 1977.

DOJ-1977-11

FOR ARGUMENT

Supreme Court, U. S.
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Nos. 76-419 and 76-528

IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,
Respondents.

No. 76-528

CONSUMERS POWER COMPANY, *Petitioner,*

v.

NELSON AESCHLIMAN, SAGINAW VALLEY NUCLEAR STUDY GROUP, *et al.*, *Respondents.*

On Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

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REPLY BRIEF FOR PETITIONER CONSUMERS POWER COMPANY

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On Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

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REPLY BRIEF FOR PETITIONER CONSUMERS POWER COMPANY

Although Consumers' principal brief adequately sets forth its reasons for believing that the decision below should be reversed, the Court may be aided by brief

responses to some of the more extreme assertions in the brief for the non-federal respondents.

I

THE ENERGY CONSERVATION ISSUE

The non-federal respondents continue to assert that the Commission simply refused to consider energy conservation—that, as they put it, "[T]he Commission's refusal to consider energy conservation issues was improper" (Br. p. 32). That the Commission did, and at length, consider such issues is detailed in our main brief (pp. 22-30), but further comment may be useful.

1. The Midland proceeding involved extensive consideration of the need for the power to be generated—in the environmental report prepared by Consumers and submitted to the Commission (R. 12,612; updated 15,697, 16,044, 16,293), in the Commission's Draft Environmental Statement (R. 16,152), and at the hearing before the Licensing Board, at which a number of the environmental contentions filed by Saginaw which it later characterized as "energy conservation" contentions were expressly dealt with (see Consumers' Br. pp. 23-24).

The complaint of the non-federal respondents is not, therefore, that the Commission "refused to consider energy conservation," but rather that it declined to consider "whether an appropriate alternative to satisfying the demand would be to set limits on particular uses of electricity" and "to inquire into whether the customary uses being made of electricity in our society are 'proper' or 'improper'" (Jt. App. p. 207). That decision was reviewed by the Appeal Board (Jt. App. pp. 305-307) and by the Commission itself in a long and

careful opinion (Jt. App. pp. 324-345), which considered each of the "energy conservation" contentions of the non-federal respondents.

2. Not only were "energy conservation" issues considered in the Midland proceeding, but also the Commission's disposition of them was entirely proper, and consistent with its position on such issues both before and after its Midland decision. Contrary to the contention of the non-federal respondents (Br. pp. 7-8) the Commission did not, before the Midland decision, assert that it had a duty or responsibility to limit demand by controlling growth. In 1971, in one of the statements cited (at p. 7) by the non-federal respondents, Dr. Schlesinger, then Chairman of the Commission, commenting on "whether our society for environmental reasons viewed broadly ought not to curb its appetite for energy and electric power," concluded:

> "Whatever the private views of the Commissioners, it would seem to me inappropriate for the Atomic Energy Commission to take a position on this issue. The AEC should be officially neutral. It is the AEC's mission to provide energy options that will serve public needs—in whatever manner the public prescribes those needs. The AEC lacks authority and consequently should avoid becoming entangled in the determination of broad social issues of this type."[1]

Nor, again contrary to the assertions of the non-federal respondents (Br. pp. 40-41), did the Commission abandon the position adopted in the Midland opinion, on either the scope of its authority and re-

[1] Speech of October 20, 1971, reprinted in, Selected Materials on the Calvert Cliffs Decision, Its Origin and Aftermath, Joint Comm. on Atomic Energy, 92d Cong., 1st Sess., p. 397.

sponsibility, or on the so-called "threshold test"—which, in essence, simply required that intervenors formulate their contentions with at least some specificity, and indicate more precisely how their suggestions might reduce the projected need for power.[2] *See, e.g., Northern Indiana Public Service Co.* (Bailly Generating Station, Nuclear-1), 7 A.E.C. 557, 615-620 (April 5, 1974); *Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Unit No. 2), 8 A.E.C. 277, 288 (Aug. 2, 1974). Even in the *Northern States Power Company* case (Prairie Island Nuclear Generating Plant, Units 1 and 2), 7 A.E.C. 487 (1974), cited on page 41 of the non-federal respondent's brief, the Licensing Board applied, in specific terms, the elements of the Midland decision, including those of the "threshold test" as it pertained to the intervenors' energy conservation contentions. *See* 7 A.E.C. 491-494.

3. It is also worth repeating that the non-federal respondents continue to ignore the fact (Br. pp. 36-39) that, notwithstanding the Commission's statement of position that it would not apply its decision in the *Niagara Mohawk* case retroactively, the statement was *obiter* only, at least insofar as Midland was concerned, since the Commission found that the decisions of the Licensing Board and the Appeal Board were fully consistent with the *Niagara Mohawk* decision. Its summary of its conclusions warrants quotation (Jt. App. p. 334):

[2] The requirement, as such, is nothing new, but stems from a long-standing provision of 10 C.F.R. §2.714(a)—specifically sanctioned by the court below—directing that contentions be stated with specificity and particularity. *See* BPI v. AEC, 502 F.2d 424, 426-429 (1974). In addition, where NEPA is involved, a rule of reason applies. Natural Resources Defense Council, Inc. v. Morton, 458 F.2d 827, 834 (D.C. Cir. 1972).

> "Summarizing the analysis [of the alleged "energy conservation" contentions] which follows, we find that Saginaw properly raised one related group of legitimate energy conservation issues which the Licensing Board allowed. Saginaw obliquely raised a second energy conservation issue essentially similar to the rate structure issue we allowed in *Niagara,* which the Board also allowed. The Board properly excluded several alleged energy conservation contentions concerning certain customer uses of electricity. Finally, several other contentions of Saginaw's allegedly precluded by the Board were in fact allowed, but they had nothing to do with energy conservation."

4. Finally, the non-federal respondents' brief refers (*e.g.,* pp. 18-21) to the recent Licensing Board hearings on the issue of whether the Commission should order that construction at Midland be suspended pending further consideration by the Commission of the issues remanded to it by the court below.[3] While those hearings are not part of the record now before the Court, some comment is warranted.

The non-federal respondents' brief offers one party's view of evidence presented during a lengthy, contested proceeding. Not surprisingly there has been and continues to be considerable dispute as to the proper conclusions to be drawn.[4] It is noteworthy, however, that the Licensing Board's order declining to suspend con-

[3] The Licensing Board, on September 23, 1977, declined to order construction suspended. Exceptions have been filed and the decision is now undergoing appellate review within the agency. *See* 2 *Nuclear Reg. Rep.* (CCH) ¶ 30,234.

[4] In fact, the non-federal respondents' brief discloses that there may be disagreement even as to what evidence was received. For example, page 19 contains the statement that Consumers recently lowered its projected demand for the year 1979 by 38.5%. This is not true. A recent "short term" sales forecast, prepared for budget-

struction found a need for both the electrical power and process steam which the Midland plant is intended to supply (*Consumers Power Company* (Midland Plant, Units 1 and 2), Order, p. 21 (slip opinion)).

More importantly, the mere reconsideration of demand information, as revised, updated, and presented during the recent suspension hearings, begs an important point. Although it has been noted before (Consumers' Br. p. 34), it bears repeating that NEPA is less demanding in cases such as the present one—where the proposal is privately planned, financed and executed—than when a federal project is involved. When a federal agency is initiating its own proposal "NEPA is 'intended to assure [environmental] consideration during the development of [the] proposal,' whereas when private action is to be approved, NEPA seeks only to assure such consideration '*during the formulation of a position on* [*the*] *proposal* submitted by private parties.' " *Kleppe* v. *Sierra Club,* 427 U.S. 390, 419 n. 1 (Marshall, J., concurring and dissenting) (emphasis added). In the case of a private undertaking, once a good faith, reasonable effort to consider environmental impacts has been made by the federal agency whose approval is being sought, no more is required. NEPA does not mandate, in the face of increasing commitments of private capital and other resources, a continuous, realtime updating of impacts and the cost-benefit analysis.

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ing purposes and not received in evidence by the Licensing Board conducting the suspension proceedings, did reflect a 38.5% reduction in the *rate* of load growth for that year, but estimated load for 1979 is now only 2.4% lower than that reflected in the prior comparable estimate. In addition, there has been no revision of demand projections contained in Consumers' "long term" planning forecasts for 1981 and 1982, when the Midland units are expected to commence operation.

II

THE ACRS REPORT

The ACRS issue in this case stems from the statutory requirement contained in Section 182b. of the Atomic Energy Act of 1954 that, "The Advisory Committee on Reactor Safeguards shall review each application . . . for a construction permit . . . and shall submit a report thereon which shall be made part of the record of the application and available to the public . . ." (42 U.S.C. § 2232(b)). There is no dispute that the literal requirements of the statute were met. The disagreement arises over whether, as the court of appals decided, the ACRS report should have been returned *sua sponte* by the Licensing Board for specification of the "other problems" in language "understandable to a layman" (Jt. App. p. 108). As both Consumers Power and the Federal Respondents have already explained, however, the law did not require such action and to have done so would have been at odds with its purpose (*see* Consumers Br. pp. 35-38; Federal Respondent's Br. pp. 66-73). Nothing which has been presented subsequently provides a basis for changing those conclusions.

It is important to note that, not only is the language of the statute clear as to the duties and role of the Advisory Committee on Reactor Safeguards, but Congress has kept itself actively informed of the conduct of ACRS business. The ACRS has, for a long time, reported to Congress concerning its activities (*e.g., Radiation Safety and Regulation Hearings Before the Joint Comm. on Atomic Energy,* 87th Cong., 1st Sess. (1961) pp. 21-29; *Licensing and Regulation of Nuclear Reactors Hearings Before the Joint Comm. on Atomic*

Energy, 90th Congress, 1st Sess. (1967), pp. 84-130). In particular, the ACRS has described to the Joint Committee on Atomic Energy the use of its "[o]ther problems" phraseology in reports (*Nuclear Reactor Safety Hearings Before the Joint Committee on Atomic Energy,* 93rd Cong., 1st Sess. (1973), pt.1, pp. 384, 405, 417). Given the responsibility and place of the Joint Committee in the statutory scheme at the time,[5] it is not unfair to read this history as a *de facto* acquiscence in and ratification of the ACRS' review procedure (*see Power Reactor Co.* v. *Electricians,* 367 U.S. 405, 409).

As for the confusion mentioned in connection with the NRC's Midland suspension hearings, contrary to the non-federal respondents' allegation (Br. p. 21), the Staff did not express the view that it was "in the dark as to what the ACRS' 'other problems' are." Rather, it expressed natural uncertainty concerning the details of the future resolution and, therefore, whether solutions would ultimately result in additional overall costs or savings. *See, e.g.,* Tr. 4260-4260-4261. This Court has observed that:

> "[N]uclear reactors are fast-developing and fast-changing. What is up to date now may not, probably will not, be as acceptable tomorrow. Problems which seem insuperable now may be solved tomorrow, perhaps in the very process of construction itself."

Power Reactor Co. v. *Electricians,* 367 U.S. 405, 408.

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[5] The Joint Committee was dissolved earlier this year and its functions have been assumed by others. *See* Act of Sept. 20, 1977, Pub. L. No. 95-110, 91 Stat. 884.

In any event, the Atomic Energy Act of 1954 provides a framework whereby reactors are licensed in a two-step, construction permit/operating license process. Within this framework the Commission can defer a definitive safety finding until it considers the application for an operating license, at which time the ACRS will again make a public report. *See id.* at 407-415. Nor does NEPA prohibit the authorization of construction because of the existence of some cost uncertainties. That Act was not intended to repeal by implication any statute, *United States* v. *SCRAP,* 412 U.S. 669, 694. To the extent there is a conflict of statutory duty, NEPA's impact statement requirement is inapplicable. *See Flint Ridge Development Co.* v. *Scenic Rivers Ass'n of Okl.,* —— U.S. ——, 96 S. Ct. 2430.

Finally, a review of the *Hartsville* case, cited at page 49 of the non-federal respondents' brief, reveals that while the Licensing Board may have desired more detail, the ACRS report did not prevent it from reaching a fully considered decision, based on the record.

III

THE "DOW" ISSUE

As noted earlier in Consumers' principal brief (p. 46), if this Court finds the Commission's actions otherwise valid, it need not be concerned with the "Dow" issue. A review of the non-federal respondents' brief suggests, however, that some clarification of the matter may be helpful.

The Midland plant is designed and situated so as to be able to provide process steam and electricity to the large Dow Chemical Company complex located nearby.

There is presently in effect a General Agreement between Consumers and Dow, to which have been added a Contract for Supply of Water (R. 25,705); an Agreement for Electric Service, or "Electric Contract" (R. 25,718); and a Contract for Steam Service, or "Steam Contract" (R. 25,731).

The current versions of the Steam and Electric Contracts were executed in January 1974, while this case was pending before the court below. Shortly thereafter, intervenors before the NRC moved that the Commission reopen the proceedings because of alleged significant changes in Dow's commitment to take process steam and electric power from the Midland plant. The matter was investigated by the Commission, and three memoranda and orders were issued (Joint App. pp. 346-351). The Commission concluded (Joint App. p. 351):

> "We have carefully reviewed the relevant portions of these contracts and reaffirm our prior determination that there are no 'changed circumstances' as alleged by Saginaw, warranting a reopening of these proceedings. We think it is sufficient to note that Dow has a contractural [sic] commitment to purchase large quantities of process steam from the completed facility, that substantial purchases of electricity are also contemplated, and that Dow's existing fossil-fueled facilities are to be maintained primarily on a stand-by basis."

Nevertheless, in remanding the case to the Commission the court below stated that it assumed "the Commission will take into account the changed circumstances regarding Dow's need for process steam, and the intended continued operation of Dow's fossil-fuel generating facilities." (Joint App. p. 109.)

The essence of the issue is that today—just as when the Commission investigated the matter in 1974, discussed *supra*,—"Dow has a contractual commitment to purchase large quantities of process steam from the completed facility, . . . substantial purchases of electricity are contemplated, and Dow's existing fossil-fueled facilities are to be maintained primarily on a stand-by basis." Although there was no minimum requirement for steam in the initial steam proposal, Dow is currently obligated to take at least 2,000,000 pounds per hour of 175 psig steam. There is no minimum requirement for 600 psig steam (*see* R. 35,684, 35,731), but based on formal notification procedures under Section 12 of the Steam Contract, Dow has indicated its desire to reserve capacities of up to 2,400,000 pounds per hour of 175 psig steam and 400,000 pounds per hour of 600 psig steam for a later date (*see Consumers Power Company* (Midland Plant, Units 1 and 2), Order of September 23, 1977, p. 12 (slip opinion)). Although Dow is no longer required to close down its fossil-fueled facilities, the company now produces its own steam, for both process and electrical generation purposes, "in antiquated facilities that will not likely be operable through 1984; which do not now meet Michigan air quality standards; and which are being operated under a waiver from the Michigan Air Pollution Control Commission (*id.* at p. 11-12) (citation omitted).

As far as electricity requirements are concerned, the initial electric proposal provided for Consumers to supply all of Dow's electrical needs, up to 400 MW, while the present electric contract provides for Consumers to supply electric energy as auxiliary or standby to Dow's existing generating facilities, with a con-

tract demand established at 300 MW. (R. 25,718). However, in view of the limited remaining useful life of the fossil-fueled units, this provision of the current contract is of no practical significance, and the need for 175 to 200 MW of electricity has been established (*Consumers Power Company* (Midland Plant, Units 1 and 2), Order of September 23, 1977, p. 21 (slip opinion)).

In sum, there have been modifications of contracts first executed in 1967—and there will likely be others—to reflect changing circumstances; nevertheless, there has been no material change in Dow's commitments. The contracts executed in 1974 and reviewed by the Commission remain unchanged.[6] Dow is committed by contract to purchase substantial quantities of process steam and is fully expected to obtain elec-

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[6] According to the non-federal respondents' brief, "Consumers told the Commission, in its June 13, 1977 Brief on the suspension issue, that the Commission is powerless to look beyond the bare fact that contracts between Dow and Consumers exist" (Br. p. 23 n. 10). While the allegation is less than clear, to the extent it states or suggests that Consumers took the position that the Commission lacked authority to look into and examine contract terms and the intent of the parties, it is—as the brief referenced in the statement itself reveals—untrue.

In addition, non-federal respondents have, in their brief, misrepresented the September 23, 1977 Licensing Board order by stating that it contains a "finding that Consumers had attempted to conceal vital information" and of the existence of an "attempt of Consumers and its counsel to suppress information concerning the Dow dispute" (Br. pp. 20 n. 8, 24). At Consumers' request, the Licensing Board clarified that part of the September 23, 1977 order that served as the basis of these misstatements, and by order dated November 4, 1977, has stated that (p. 2):

> "No such findings were made nor intended. Nor have we concluded that there was any misconduct on the part of attorneys in this proceeding in the questioned paragraphs."

tricity from Consumers. Further, while Dow is no longer required by contract to close down its fossil-fueled facilities[7] it has no plans other than to cease operating them when supplys of process steam and electricity become available from Midland.[8]

IV

THE FUEL CYCLE ISSUE

This matter is dealt with in detail in the brief of *Vermont Yankee,* and Consumers adopts the position taken therein with respect to this issue.

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[7] On pages 15 and 16 of their brief, the non-federal respondents refer to "the closing of *Dow's fossil-fuel facilities,*" "the closing of *Dow's plant,*" and "the closing of *Dow's fossil-fuel plant*" (emphasis added). In context, it is clear that these phrases are equivalent, especially since the closing down of the Dow complex at Midland—which might be taken to be the meaning of "Dow's plant"—is not contemplated by anyone and no way in issue here.

[8] In any event, the Commission found that, while the closing of Dow's fossil-fuel facilities was a factor, it was not determinative in the NEPA cost-benefit analysis. Joint App. p. 349. For example, it was not made a condition of the construction permits (R. 23,083, 23,086) nor was it mentioned in the summary of adverse and beneficial effects in the FES (R. 17,355, 17,356-357).

CONCLUSION

Wherefore, Consumers believes that the argument and conclusions of its principal brief remain valid, and respectfully renews its plea that the decision of the court below be reversed, and that the petitions to review the order of the Commission granting construction permits to Consumers for the Midland plant be dismissed.

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v.

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Respondents.

MOTION FOR LEAVE TO MAKE POST-ARGUMENT FILING AND SUGGESTION OF MOOTNESS AND MOTION TO DISMISS WRIT OF CERTIORARI AS IMPROVIDENTLY GRANTED

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MOTION FOR LEAVE TO MAKE POST-ARGUMENT FILING

During oral argument the Court addressed a number of questions to the parties concerning whether the Court's decision in this case could affect the license for the Vermont Yankee facility. We felt that issue was not clearly presented to the Court at that time. In order to set the issue clearly before the Court with all relevant facts, we request leave to file the attached Suggestion of Mootness and Motion to Dismiss Writ of Certiorari as Improvidently Granted.

Respectfully submitted,

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IN THE

Supreme Court of the United States

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NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,
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SUGGESTION OF MOOTNESS AND MOTION TO DISMISS WRIT OF CERTIORARI AS IMPROVIDENTLY GRANTED

During oral argument the Court addressed a number of questions to the parties concerning whether the Court's decision in this case could affect the license for the Vermont Yankee facility. We felt that issue was not clearly presented to the Court at that time and are filing this memorandum to address the issue fully.[1] Because it is

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[1] As the Court will see, all of the facts pertinent to this issue were know by September 16, 1977. Clearly the question of the mootness of the Vermont Yankee proceeding and the motion being filed today to dismiss the writ of certiorari as improvidently granted should have been brought to the Court's attention before now. Although all parties have an equal obligation to focus the Court's attention on possible mootness, respondents accept greater responsibility, for respondents are the parties who have opposed certiorari. Nonetheless, in light of the Court's clearly evinced interest in the mootness question at oral argument and the continuing obligation of members of the bar of this Court, we believe it far better to be tardy than totally to ignore this question.

clear that whether this Court affirms or reverses the decision of the court below it will not affect the Vermont Yankee license, we move that the writ of certiorari be dismissed as improvidently granted.

The Court of Appeals' decision adjudged two issues, in two consolidated cases: (1) whether a nuclear power station (Vermont Yankee) could be licensed by the Commission without any consideration of the adverse effects on the environment of the wastes generated by the plant;[2] and (2) whether the Commission had adequately addressed these effects in a later "generic rulemaking" proceeding.[3] Petitions for review of the lower court's decision in each case were filed with the Court, but a writ was granted only with respect to the Vermont Yankee case.[4] Thus, the only ruling of the Court of Appeals before the Supreme Court is the lower court's ruling that the Commission erred in granting an operating license to Vermont Yankee without any consideration of the environmental effects of Vermont Yankee's waste products.[5]

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[2] *Natural Resources Defense Council, Inc. and New England Coalition on Nuclear Pollution, Inc.* v. *U.S. Nuclear Regulatory Comm'n.* (Vermont Yankee), Civ. No. 74-1385 before the Court of Appeals.

[3] *Natural Resources Defense Council, Inc. and Consolidated National Intervenors, Inc.* v. *U.S. Atomic Energy Commission*, Civ. No. 74-1586 before the Court of Appeals.

[4] Petitioner Vermont Yankee petitioned for review of the Court of Appeals ruling on the first issue (No. 76-419, granted); Nominal respondent Baltimore Gas and Electric Co. petitioned for review of the Court of Appeals decision on the second issue (No. 76-548, not granted); a petition for certiorari was also filed and granted in *Consumers Power Company* v. *Nelson Aeschliman* (No. 76-528, granted), which involved, *inter alia*, the same issue as the Vermont Yankee proceeding. App. 109.

[5] Petitioners have assumed that this case presents for review the issue of the adequacy of the procedures used in developing the original S-3 regulation. That issue arises out of the decision of the court below in which certiorari was not granted; the NRC has rescinded that original S-3 regulation; the new S-3 regulation proceeding utilizes procedures which differ from those involved in the original S-3 rulemaking. 42 Fed.Reg. 26989 (May 26, 1977). Thus, what is sought from this Court is an advisory opinion on the adequacy of procedures used to develop a record as the basis for rulemaking with respect to a rule which is no longer applicable to any nuclear power plant and whose previous application to nuclear power plants failed to produce a single Petition for Review from an owner of those plants. Whether or not procedures now being used to develop the final S-3 regulation are adequate will be directly dependent on the facts of that case and any party that believes the procedures are too extensive should either have challenged the order establishing the procedures or should challenge the final regulation. What cannot be done is to freight the Vermont Yankee proceeding with the issue and obtain this Court's advice outside a real case or controversy.

Following the decision of the Court of Appeals, the Commission promulgated an interim S-3 Table rule pending completion of a new rulemaking to produce a final S-3 Table rule and directed that it be made applicable to new licenses and retroactively to certain already-issued licenses including the Vermont Yankee operating license. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), *et al.*, CLI-77-10, 5 NRC 717 (April 1, 1977). Vermont Yankee did not appeal that decision. On April 18, 1977, at the request of the respondent New England Coalition on Nuclear Pollution, the Commission applied the interim S-3 Table values to the Vermont Yankee plant and concluded that even with those values included as costs of the plant, the plant's operation should continue. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), ALAB-421, 6 NRC 25 (July 18, 1977). Vermont Yankee did not appeal the addition of the interim S-3 Table costs to its environmental cost/benefit analysis.

It is critical to understand that the application of the interim S-3 Table values to Vermont Yankee has had no impact on its operating license. Although the interim

S-3 Table does have an 18-month duration which expires on September 14, 1978, the expiration does not affect the validity of any license to which the interim S-3 Table values have been applied. 42 Fed.Reg. 13803, 13806 (March 14, 1977). Rather, as the interim regulation clearly states, at the expiration of the 18-month period the S-3 Table values may not be applied to any *new* licensing proceedings (*Id.*):[6]

> "The values set forth in Table S-3 in this paragraph will not be applied in any proceeding as of September 14, 1978."

The assertion by counsel for Vermont Yankee at oral argument that his client now has an 18-month license when it previously held a 40-year license is not correct. It continues to hold a 40-year operating license from the Commission subject to the same limitations and conditions to which all Commission licenses are subject.[7]

---

[6] Even this time limit is of dubious relevance because the Commission indicated that it would be extended for good cause, which the Commission would presumably determine existed if it had not yet completed the procedures to adopt a final S-3 Table rule. 42 Fed.Reg., *supra*, at 13806.

[7] Vermont Yankee's original full-power operating license was issued on October 11, 1972, pursuant to Section 192 of the Atomic Energy Act (42 U.S.C. § 2242). It was a temporary operating license which was to expire by statute no later than October 30, 1973. On February 28, 1973, the Commission issued a full-term, full-power operating license. That license contained several conditions, including the following (*In the Matter of Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), NRC Docket No. 50-271, LBP-73-8, 6 AEC 149 (1973)):

> This license . . . is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now *or hereafter in effect*; . . . . (Emphasis added.)

Since the date of issuance, the Vermont Yankee license has been amended 35 times, some of which amendments affected Vermont Yankees' authority to operate the plant. For instance, one of those amendments, imposed by the Commission, required the plant to operate at only 75% of its rated power pending resolution of an important safety issue. *Vermont Yankee Nuclear Power Corporation*

When the Commission replaces the interim S-3 Table with a final S-3 Table, the final rule will be applicable to Vermont Yankee and, upon the request of an interested party, the Commission will once again reconsider the Vermont Yankee operating license. However, that action will be taken not because of the decision of the court below nor will it be affected by any decision of this Court.

In its brief, the Commission has already declared that regardless of the outcome of this case the Commission intends to complete its S-3 Table rulemaking and adopt a final S-3 Table regulation.[8] Govt. Br., p. 37, fn. 36. Thus, even if this Court reverses the decision of the court below, the Commission application of the interim

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(Vermont Yankee Nuclear Power Station), ALAB-141, 6 AEC 576 (August 22, 1973). That prohibition was subsequently lifted when the safety issue was deemed resolved. *Vermont Yankee Nuclear Power Corporation* (Vermont Yankee Nuclear Power Station), LBP-74-8, 7 AEC 128 (January 22, 1974). The application of the interim S-3 rule to Vermont Yankee did not result in any amendment to the Vermont Yankee license and that license still includes the following provisions:

> "Vermont Yankee is authorized to operate the facility at reactor core power levels not to exceed 1593 megawatts thermal [full-power] in accordance with the Initial Technical Specifications (Appendices A and B) appended hereto.
>
> * * * *
>
> "This license is effective as of the date of issuance and shall expire at midnight on December 11, 2007 [40 years from issuance of the original construction permit]." (Brackets added.)

[8] Pursuant to Section 186(a) of the Atomic Energy Act (42 U.S.C. § 2236) and to 10 CFR § 50.100, the NRC is authorized to revoke, suspend or modify any operating license, when, *inter alia*, a fact or report is revealed which if known when the license was originally issued would have warranted the action now being taken. Thus, there is no question of the authority of the Commission to revise the S-3 Table values and apply them retroactively to a facility which has already been licensed. The Vermont Yankee case was litigated because of the Commission's refusal to exercise that authority. It has now agreed to exercise that authority irrespective of the outcome of this case.

rule to Vermont Yankee which requires that the environmental effects of Vermont Yankee's wastes be factored into the environmental impact statement for the plant will still apply, and when the Commission replaces the interim rule with a final rule that rule will also be applicable to Vermont Yankee.

If Vermont Yankee is aggrieved by the NRC actions, it has, or had, full recourse. If it believes no interim S-3 regulation should have been applicable to it, it should have appealed the order authorizing that application or the order making that application. If it believes no final S-3 Table regulation should apply to it, it should have either challenged the order making the interim S-3 Table regulation applicable to it which in effect announced that policy or should challenge subsequent actions to be taken by the Commission in adopting the final S-3 Table regulation and making it applicable to Vermont Yankee. For this Court to now decide the case before it is to decide an issue which it is too late to raise (Vermont Yankee did not challenge the application of the interim S-3 Table to it) or too early to raise (Vermont Yankee has not yet had the final S-3 Table applied to it).

Vermont Yankee and the NRC have acquiesced in the principle that the Vermont Yankee operating license should be subject to re-examination in light of the Commission conclusions about the environmental effects of reprocessing and waste disposal. That is the only issue which was raised by the decision below. There is no basis for this Court to exercise its certiorari powers where, as here, there is no genuine case or controversy presented.

CONCLUSION

For the foregoing reasons, we urge the Court to dismiss the writ of certiorari as improvidently granted.

Respectfully submitted,

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December 1, 1977

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Nos. 76-419 and 76-528

IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION, *Petitioner,*

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*, *Respondents.*

No. 76-528

CONSUMERS POWER COMPANY, *Petitioner,*

v.

NELSON AESCHLIMAN, SAGINAW VALLEY NUCLEAR STUDY GROUP, *et al.*, *Respondents.*

On Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

RESPONSE OF CONSUMERS POWER COMPANY IN NO. 76-419 TO MOTION FOR LEAVE TO MAKE POST-ARGUMENT FILING AND SUGGESTION OF MOOTNESS AND MOTION TO DISMISS WRIT OF CERTIORARI AS IMPROVIDENTLY GRANTED

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
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v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,
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RESPONSE OF CONSUMERS POWER COMPANY IN NO. 76-419 TO MOTION FOR LEAVE TO MAKE POST-ARGUMENT FILING AND SUGGESTION OF MOOTNESS AND MOTION TO DISMISS WRIT OF CERTIORARI AS IMPROVIDENTLY GRANTED

While the Suggestion of Mootness and Motion to Dismiss the Writ of Certiorari as Improvidently

Granted is filed only in respect to No. 76-419, *Vermont Yankee Nuclear Power Corporation* v. *Natural Resources Defense Council, et al.*, and indeed only to the extent to which the writ in that case sought review of the decision of the court below in *Natural Resources Defense Council, et al* v. *Nuclear Regulatory Commission*, No. 74-1385, it may be of assistance to the Court to make clear that the contentions there advanced do not apply to the writ of certiorari in No. 76-528, *Consumers Power Co.* v. *Aeschliman*. Even if the Court should decide that the issue of the validity of the fuel cycle rule is now moot as to Vermont Yankee, that issue would not be moot as concerns the construction permits for Consumers' Midland Nuclear Power Plant.

In the *Consumers* case, unless the decision below is reversed by this Court, hearings will be held on the three issues remanded to the Commission by the court below and discussed in our brief—energy conservation, the Advisory Committee report, and the fuel cycle.[1] Consumers' construction permits, which are challenged by the non-federal respondents, are at risk in those hearings. If the court below erred, as Consumers contends, Consumers' construction permits are valid, and it may proceed with construction freed from not only the further hearings, but also the risk that its construction permits may be suspended until those hearings are ended.[2] For this reason, the state-

[1] The hearings which have been held in the Consumers proceeding since the decision below have been concerned only with the issue whether Consumers' construction permits should be suspended pending the further hearings on the remanded issues.

[2] The decision of the Licensing Board refusing to suspend the construction license has been appealed by the non-federal respondents to the Appeal Board, where it is presently pending awaiting decision.

ment in the Suggestion of Mootness to the effect that the Commission's actions following the decision below have brought about a situation in which Vermont Yankee now continues to hold its operating license "subject to the same limitations and conditions to which all Commission licenses are subject . . ." (p. 3; footnote omitted), whatever its validity in the context of the Vermont Yankee situation, cannot be made with respect to the Midland construction permits.

The Court should also be aware that, so far as concerns the fuel cycle issue, the decision of the court below in No. 74-1586 is read with the Consumers proceeding (Jt. App. p. 109).[3] That decision has been challenged in Consumers' briefs in this Court, and constitutes part of the mandate directed to the Commission in the Consumers proceeding. This aspect of the further challenge to Consumers' permits which has been mandated by the court below would be ended by a decision by this Court that the Commission need not be concerned, under NEPA, with the ultimate disposition of the spent fuel (Br. p. 40) or, alternatively, that the legislative-type hearing under which the rule-making in this issue was conducted was a valid exercise of the Commission's power (Br. pp. 41-46).

So far as the latter issue is concerned, the fuel cycle rule here at issue and which we believe to be valid expressly provides that Table S-3 will not be required to be applied retroactively to nuclear power

[3] Consumers is also a party-intervenor in that proceeding (Jt. App. p. 6).

plants like Midland because the Commission concluded "that the environmental effects of the uranium fuel cycle has been shown to be relatively insignificant . . ." (Jt. App. pp. 395, 398). The court below was aware of this (Jt. App. p. 42, n. 19). It recognized that NEPA has not precluded the Commission from limiting the consideration of the environmental effects of the fuel cycle—including the effects of reprocessing and waste disposal—to generic rulemaking proceedings so long as such matters are given "adequate consideration" (Jt. App. pp. 39-40, n. 17). *See also, Potomac Electric Power Company* (Douglas Point Nuclear Generating Station, Units 1 & 2), ALAB 218, 8 AEC 79, 85 (1974); Appendix to Petition for Certiorari in No. 76-528, pp. 286, 294.

Finally, the Commission has taken no action since the issuance of the decisions below which would require the fuel cycle issue to be reconsidered in the Midland proceeding if the original fuel cycle rule should be upheld by this Court. The interim S-3 promulgated by the Commission is, by its terms, effective only after March 14, 1977, and is not applicable to environmental reports submitted prior to June 6, 1974 (Fed. Reg. Vol. 42, pp. 13806-7).

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IN THE

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OCTOBER TERM, 1977

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.,

Respondents

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

PETITIONER'S RESPONSE IN OPPOSITION TO MOTION FOR LEAVE TO MAKE POST-ARGUMENT FILING

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1977

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,

Petitioner

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.,

Respondents

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

PETITIONER'S RESPONSE IN OPPOSITION TO MOTION FOR LEAVE TO MAKE POST-ARGUMENT FILING

Respondents have moved for leave to make post-argument filing of a document entitled "Suggestion of Mootness and Motion to Dismiss Writ of Certiorari as Improvidently Granted." Petitioner Vermont Yankee opposes the Motion for Leave because it fails to comply with this Court's Rules and adds nothing new.

Respondents have already made one supplemental filing directed to an alleged mootness problem. *See* Supplemental Statement of Facts of Respondents (filed November 26, 1977). The alleged mootness problem was then discussed by counsel for both petitioner and respondents during oral

argument. Respondents nevertheless seek this Court's indulgence to make a second supplemental filing directed to the same matter. Respondents' present Motion for Leave, however, like the Supplemental Statement which preceded it by only a few days, fails to comply with the Rules of this Court. Supreme Court Rule 41(5) lists the matters which may be presented in a supplemental brief. Rule 41(6) provides that post-argument filings be made only "upon special leave." The Motion for Leave does not even purport to come within any of the categories listed in Rule 41(5). There is no request for "special leave" pursuant to Rule 41(6). There is not even a suggestion of any basis on which this Court should permit such an extraordinary post-argument filing. Respondents' Suggestion of Mootness itself provides nothing new.* On the contrary, respondents acknowledge that all the facts they deem pertinent have long been known, *see* Suggestion of Mootness 1 n.1, and the theories they present were fully canvassed in the course of oral argument.

*Only the Motion for Leave is presently before the Court. It would therefore be inappropriate now to respond in detail to the numerous points requiring correction in respondents' recent and proposed filings except to note the following:

Obviously this Court's decision will affect Vermont Yankee's license. Respondents' own Suggestion of Mootness states that the first issue "adjudged" by the Court of Appeals was "(1) whether a nuclear power station (Vermont Yankee) could be licensed by the Commission without any consideration of the adverse effects on the environment of the wastes generated by the plant." Suggestion of Mootness 2. However, on page 5 of the same document respondents maintain that "When the Commission replaces the interim S-3 Table with a final S-3 Table, the final rule will be applicable to Vermont Yankee and, *upon the request of an interested party, the Commission will once again reconsider the Vermont Yankee operating license.*" Suggestion of Mootness 5 (emphasis added). Thus, absent reversal of the Court of Appeals' decision, upon expiration of the interim rule Vermont Yankee's license will be reconsidered (*i.e.*, placed in jeopardy) at the request of any "interested party," because of the Court of Appeals' command, issued in the very decision now before this Court, to ventilate more thoroughly the environmental effects of the fuel cycle facilities.

CONCLUSION

The proposed filing is merely repetitive and the Motion for Leave should be denied.

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The suggestion that *Vermont Yankee* has made its case moot by a failure to appeal two NRC decisions is frivolous. Under 28 U.S.C. § 2344 judicial review may be had only of "final" NRC orders by a party "aggrieved" thereby. CLI-77-10 was an interlocutory decision; ALAB-421 was a decision *favoring* Vermont Yankee and Vermont Yankee was obviously not aggrieved by it. In fact, respondents themselves have appealed from the Commission's decision promulgating the interim rule. *Natural Resources Defense Council* v. *NRC*, No. 77-1448 (D.C. Cir., filed May 13, 1977). And, contrary to the statement made in the Supplemental Statement of Facts of Respondents that "no Petition for Review has been filed," one of the respondents, in fact, has appealed from the Appeal Board Decision, ALAB-421. *New England Coalition on Nuclear Pollution* v. *NRC*, No. 77-1342 (1st Cir., filed July 28, 1977). In its petition in the First Circuit, New England Coalition on Nuclear Pollution (NECNP) purported to appeal only from that portion of the ALAB-421 decision which dealt with the Seabrook Station in New Hampshire. However, because of uncertainty whether the issue on appeal is so limited, Vermont Yankee moved to intervene in the First Circuit proceedings on August 2, 1977. Its motion to intervene was not opposed by NECNP and was granted by the First Circuit on August 12, 1977.

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No. 76-528

CONSUMERS POWER COMPANY, *Petitioner,*
v.
NELSON AESCHLIMAN, *et al.*, *Respondent.*

On Petition For Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

MOTION FOR LEAVE TO FILE BRIEF AS AMICUS CURIAE AND BRIEF OF AMICUS CURIAE PACIFIC LEGAL FOUNDATION IN SUPPORT OF PETITIONERS

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IN THE

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OCTOBER TERM, 1976

No. 76-419

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CONSUMERS POWER COMPANY, *Petitioner,*

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NELSON AESCHLIMAN, *et al.*, *Respondent.*

On Petition For Writ of Certiorari to the United States Court of Appeals For the District of Columbia Circuit

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MOTION OF PACIFIC LEGAL FOUNDATION FOR LEAVE TO FILE BRIEF AS AMICUS CURIAE IN SUPPORT OF PETITIONERS

Pursuant to this Court's Rule 42, Pacific Legal Foundation hereby respectfully moves the Court for leave to file its brief *amicus curiae* bound with this motion. Consent was sought from counsel for all Respondents, one of whom responded in the negative while the remainder

failed to respond. Pacific Legal Foundation has received the written consent of counsel for Petitioners and also the Solicitor-General of the United States to file its brief *amicus curiae*. All of these documents have been filed with the Clerk.

The accompanying brief urges this Court to reverse the decisions of the Court of Appeals in *Natural Resources Defense Council* v. *Nuclear Regulatory Commission*, 547 F.2d 633 (D.C. Cir. 1976) and *Aeschliman* v. *Nuclear Regulatory Commission*, 547 F.2d 622 (D.C. Cir. 1976).

Pacific Legal Foundation is a nonprofit, tax-exempt corporation organized and existing under the laws of California for the purpose of engaging in litigation in matters affecting the broad public interest. Policy for the Pacific Legal Foundation is set by a Board of Trustees composed of concerned citizens, the majority of whom are attorneys. The Board evaluates the merits of any contemplated legal action and authorizes such legal action only where the Foundation's position has broad support within the general community.

The Pacific Legal Foundation believes the action of the Court below in setting aside the Commission's [1] uranium fuel cycle rule [2] and their injection of a new pro-

[1] The term "the Commission" is used herein to refer to both the U.S. Atomic Energy Commission (AEC) and the agency that succeeded to its regulatory responsibilities on January 19, 1975, the U.S. Nuclear Regulatory Commission. 42 U.S.C. §§ 2011-2282 (1970 & Supp. V 1975); Exec. Order No. 11834, 3A C.F.R. 111 (1975), *reprinted* in 42 U.S.C. 5801 (Supp. V 1975).

[2] The "uranium fuel cycle rule" (commonly called Table S-3) was promulgated by the Atomic Energy Commission on April 22, 1974 (39 Fed. Reg. 14188) and is codified at 10 C.F.R. 51.20(e)

cedural standard into agency rulemaking proceedings will adversely affect the general welfare of the people of this nation. Further, these rulings are squarely in conflict with this Court's holdings in *Kleppe* v. *Sierra Club*, 427 U.S. 390 (1976) and *Permian Basin Area Rate Cases*, 390 U.S. 747 (1968).

Pacific Legal Foundation considers the decisions below to be extremely significant in that they cripple the ability of private industry to utilize nuclear power to meet the public requirements for energy. If the decisions of the Court of Appeals are allowed to stand, consequences on the public will be severe, including shortages of electricity and an escalation in consumer prices, as well as substantial and unnecessary social, economic and environmental costs.[3]

Unless these decisions are reversed the Commission and all other agencies engaged in rulemaking pursuant to 5 U.S.C. § 553 (1970) will be burdened with unreasonably vague procedural requirements which are certain to result in costly delays in such proceedings. Further, an additional burden will be placed on the federal court system as a result of litigation over the meaning

(1977). The Commission intended that, with the inclusion of environmental impacts from Table S-3, the environmental impact statements for individual light water reactors would set forth a full and candid assessment of costs and benefits consistent with the legal requirements and spirit of the National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321 *et seq.* *See* 42 Fed. Reg. 13803 (March 14, 1977).

[3] *See, e.g.*, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, IMPACTS OF LATER REVERSING A DECISION TO ADOPT OR NOT TO ADOPT AN INTERIM RULE PERMITTING CONSTRUCTION OR OPERATION OF NUCLEAR POWER PLANTS, (1976); Burnett, *The Human Cost of Regulatory Delays*, 33 NUCLEAR TECH. 283 (1977).

of the new requirements developed by the Court of Appeals and injected into rulemaking proceedings by its interpretation of The National Environmental Protection Act.

The Pacific Legal Foundation, due to its unique public interest perspective, believes that it can provide this Court with a more complete argument of the public interests at stake in this litigation.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,
Respondent.

No. 76-528

CONSUMERS POWER COMPANY, *Petitioner,*

v.

NELSON AESCHLIMAN, *et al.*, *Respondent.*

On Petition For Writ of Certiorari to the United States Court of Appeals For the District of Columbia Circuit

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BRIEF OF AMICUS CURIAE PACIFIC LEGAL FOUNDATION IN SUPPORT OF PETITIONERS

INTEREST OF AMICUS

The interest of the *amicus curiae* is set out in the preceding motion to file this brief.

OPINIONS BELOW

The United States Court of Appeals for the District of Columbia Circuit, *Natural Resources Defense Council, Inc.* v. *United States Nuclear Regulatory Commission,* 547 F.2d 633 (D.C. Cir. 1976) concluded, *inter alia,* that the Atomic Energy Commission's rule [hereinafter "Table S-3"] codifying the environmental effects of the uranium fuel cycle for individual light-water reactors, 10 C.F.R. 51.20(e) (1977), must be set aside and remanded because the rulemaking proceedings underlying its promulgation were inadequate.

In a companion opinion, *Nelson Aeschliman* v. *United States Nuclear Regulatory Commission,* 547 F.2d 622 (D.C. Cir. 1976), the Court of Appeals incorporated by reference its decision reported at 547 F.2d 633 and remanded to the Commission its decision granting permits to construct two nuclear reactors with instructions that there be further clarification of a report of the Advisory Committee on Reactor Safety. The Commission was further instructed to consider issues relating to fuel conservation and to restrike the cost-benefit balance in view of the reconsideration of the fuel cycle and energy conservation issues.

I

THE DECISION OF THE COURT OF APPEALS IS CONTRARY TO THE BEST INTERESTS OF THE AMERICAN PUBLIC

The United States is presently faced with an unprecedented energy shortage which threatens the economic and social well-being of the nation. Declining domestic production of oil, the real threat of future cut-offs of foreign supplies, and the growing realization that dwindling supplies of fossil fuels must be conserved for

future generations have forced this country into a search for safe, economical, and viable alternatives to supply energy to its homes, factories, and schools. Both Congress, in enacting the Energy Reorganization Act of 1974, 42 U.S.C. § 5801 (1975) *et seq.*, and President Carter, in his recent proposals for a national energy policy, have recognized the importance of nuclear power as an alternative source of energy. In fact, as experts have pointed out, nuclear power is the only non-fossil energy source which is economically and technically feasible to meet this nation's immediate need for electricity. Forbes, et al., THE NUCLEAR DEBATE: A CALL TO REASON 1 (2d ed.) (1976); Nuclear Energy Policy Study Group, NUCLEAR ISSUES AND CHOICES, 109-155 (1977).

The ability of nuclear power to meet the public's growing need for electricity is amply demonstrated by its past performance and the public's reliance thereon. Nuclear powered electric generating plants in the United States accounted for about 40,000 megawatts of electric capacity (MWe), or about 8% of total national capacity in mid-1976. In early 1977, some 170,000 MWe of additional nuclear capacity was under construction or on order and scheduled to begin operation by the mid-1980's. Nuclear Energy Policy Study Group, *supra* at 5. Despite the demonstrated need for increased use of alternative power sources and the demonstrated ability of nuclear power to fill this need, proposals to build nuclear power plants are being strangled by unnecessary procedural delays. Although Congress has entrusted the responsibility for determining the safety and feasibility of nuclear energy use to the Commission, 42 U.S.C. § 2201(b), the Court of Appeals has attempted to second-guess the Commission's decision.

As Judge Skelly Wright pointed out, the result of such *post hoc* procedural requirements imposed by the courts is "to force the agencies to over-proceduralize their rulemaking deliberations . . . eliminating one of rulemaking's principal advantages over individualized proceedings: expeditious action to meet our society's needs." Wright, *Court of Appeals Review of Federal Regulatory Rulemaking,* 26 ADMIN.L.REV. 199, 207 (1974). In the case of nuclear power plants, the result has been an ever-increasing delay between the development of nuclear power proposals and the issuance of licenses to begin construction, and a similar delay between construction and final operations.

The uncertainties injected in the Commission's licensing proceedings by the Court of Appeals' decisions have already imposed a moratorium on the issuance of final construction permits and operating licenses for nuclear fuel light water reactors. See Pet. No. 76-419, Petitioner's Supplemental Brief and Supplemental Appendix, at 5-8. These procedural delays have contributed substantially to decisions by private utilities to abandon nuclear powered electrical generating facilities and resulted in substantial cost being incurred by the public.[1] Delays in licensing procedures and abandonment of planned facilities not only entail substantial economic loss but will also result in significant health and environmental costs. *See* note 3 *supra.* The economic losses are inevitably passed on to the utilities' investors and

[1] See, *e.g. Nucleonics Week,* March 24, 1977, at 6 (". . . FP&L has just canceled two 1,160-MW nuclear units after a $20 million investment 'out of frustration with the licensing process and escalating costs' "); *Washington Post,* March 17, 1977, at E1, col. 1, ("Customers of the Virginia Electric and Power Co. may lose as much as $146 million if the company cancels construction of two reactor units at its Surry nuclear power plant. . . .").

consumers, while the environmental and health costs are borne by all.

With full knowledge of the risks inherent in the continued use of nuclear energy, Congress and the Commission have determined that the benefits to the public outweigh the risks to the public. This determination by Congress and the Commission should not be overturned lightly by the courts. The vague procedural requirements of the Court of Appeals improperly permit mere argument alone "against the principled judgment of agencies charged with the protection of the public interest to bring essential economic development to a standstill by magnification of slight possibilities into the horror of impending doom." *Citizens for Safe Power* v. *Nuclear Regulatory Commission,* 524 F.2d 1291, 1301 n.15 (D.C. Cir. 1975).

In addition, the vagueness of the additional procedural requirements imposed by the Court of Appeals under the rubric of "hybrid" proceedings will certainly lead to additional dilatory litigation. This litigation will impose an additional burden on an already over-burdened judicial system, at substantial cost to the public. Indeed, additional litigation on similar issues is now burdening the court system.

The Commission, in an attempt to avoid the unnecessary costs of the hiatus in its licensing functions occasioned by the decisions of the Court of Appeals, promulgated a "final interim rule" intended to replace Table S-3 until such time as an acceptable final rule could be promulgated, or eighteen months, whichever occurs first. 42 Fed. Reg. 13803 (March 14, 1977). Despite the extensive documentary support for this interim rule, and the more than adequate notice and com-

ment period preceeding its promulgation, Natural Resources Defense Council has petitioned the United States Court of Appeals for the District of Columbia for review of this interim rule. *Natural Resources Defense Council* v. *Nuclear Regulatory Commission,* No. 77-1448 (D.C. Cir., filed May 13, 1977). While the action of the Court of Appeals in response to this petition is not to be presumed, there is a significant possibility that it may vacate the Commission's interim rule resulting in an absolute prohibition on licensing. Thus unless this Court act expeditiously to reverse the decisions of the Court of Appeals, the American public may be unnecessarily deprived of the beneficial use of nuclear energy for a long time to come.

II

THE COURT OF APPEALS HAS DEVISED A NOVEL AND INAPPLICABLE STANDARD OF REVIEW OF THE RULEMAKING PROCEDURES OF THE NUCLEAR REGULATORY COMMISSION

A

Mandate and Function of the Nuclear Regulatory Commission

Congress, by enacting the Atomic Energy Act of 1954 (AEA), 42 U.S.C. § 2011 *et seq.* (1970), entrusted the regulation and control of the peaceful uses of nuclear energy to the Atomic Energy Commission (the Commission).[2] In so doing Congress created a "regulatory scheme which is virtually unique in the degree to which broad responsibility is reposed in the administering agency, free of close prescription in its charter as to how it shall proceed in achieving the statutory objectives." *Siegel* v. *AEC,* 400 F.2d. 778, 783 (D.C. Cir.

[2] *See,* note 1, Motion for Leave to File Brief; *Power Reactor Development Co.* v. *International Union of Electrical, Radio and Machine Workers,* 367 U.S. 396, 404 (1961).

1968). The Commission is authorized to prescribe such regulations or orders as it deems necessary to protect the public health and minimize danger to life or property, and make such other rules and regulations as are necessary to carry out the purposes of the AEA.[3]

B

The Commission's Promulgation of Table S-3 Was In Total Compliance With the Informal Rulemaking Provisions of Both the AEA and APA

As the Court of Appeals properly recognized, when promulgating Table S-3 the Commission was engaged in a rulemaking proceeding pursuant to the AEA and Administrative Procedure Act (APA),[4] 5 U.S.C. § 500, *et seq.* Section 181 of the AEA, 48 U.S.C. § 2231 (1970), makes the provisions of the APA applicable to all Commission administrative actions. *Siegel,* 400 F.2d at 785. The minimum requirements of a rulemaking proceeding governed by the provisions of the APA, 5 U.S.C. § 553, are,

> . . . that notice of proposed rulemaking shall be published in the Federal Register, that after notice the agency give interested persons an opportunity to participate in the rulemaking through appropriate submissions, and that after consideration of the record so made the agency shall incorporate in the rules adopted a concise general statement of their basis and purpose. (footnote omitted) *United States* v. *Allegheny-Ludlum Steel Corp.,* 406 U.S. 742, 758 (1972).

While Section 189(a) of the AEA, 42 U.S.C. § 2239 (a) (1970), provides interested parties the right to a

[3] Atomic Energy Act of 1954, § 161, 42 U.S.C. § 2201 (1970).

[4] *Natural Resources Defense Council,* 547 F.2d at 637-638.

hearing in such rulemaking proceedings, neither the APA nor the Commission's rules, 10 C.F.R. § 2.805 (1977), require an evidentiary hearing. *Nader* v. *Nuclear Regulatory Commission,* 513 F.2d 1045, 1051 (D.C. Cir. 1975); *Siegel,* 400 F.2d at 785. Indeed the right to participate in a hearing before the Commission "does not necessarily embrace either the right to present evidence orally and to cross examine opposing witnesses, or the right to present oral argument to the agency's decisionmaker." *United States* v. *Florida East Coast Railway,* 410 U.S. 224, 240 (1973). Nor is the Commission required to hold a hearing on the record when engaged in informal rulemaking. *Allegheny-Ludlum Steel Corp.,* 406 U.S. at 756; *Siegel,* 400 F.2d at 785-86.

When the Commission issued Table S-3, 10 C.F.R. 51.20(e) (1977), it had fully complied with the requirements of all applicable statutes. However, the Commission went far beyond the "bare minima."

The Commission's decision was based on a 260 page, single spaced "Final Environmental Survey of the Nuclear Fuel Cycle" published by the AEC's Directorate of Licensing;[5] written comments of 46 participants[6] and the Regulatory staff; a 520 page transcript of oral proceedings on the subject;[7] all documents referenced in the foregoing submissions; a report of a three member hearing board;[8] and lastly, the lengthy Statement

[5] Environmental Survey of the Uranium Fuel Cycle, WASH-1428, 39 Fed. Reg. 14188 (April 16, 1974).

[6] Written comments were received in response to notice in the Federal Register, 38 Fed. Reg. 49 (Jan. 14, 1973).

[7] Uranium Fuel Cycle, U.S. AEC Docket No. RM-50-3 (January 17, 1973 and February 1 and 2, 1973).

[8] The Board was appointed by notice at 38 Fed. Reg. 49 (January 14, 1973).

of Consideration issued by the Commission with the final rule.[9] The Commission's final conclusions were properly based on a full rulemaking docket and its own expertise. As such they should be sustained. *Ethyl Corp.* v. *EPA,* 541 F.2d 1 (D.C. Cir.) (*en banc*), *cert. denied* 96 S.Ct. 2663 (1976); *Siegel,* 400 F.2d at 786 (quoting *California Citizen's Band Association* v. *United States,* 375 F.2d 43, 54 (9th Cir.) *cert. denied,* 389 U.S. 844 (1967)).

In light of the substantial administrative record, reflecting extensive public input and consideration of the available relevant technical information prior to its promulgation of Table S-3, the Commission's action was a proper one, and should be fully sustained. *Ethyl Corp.,* 514 F.2d at 33-38.

C

The Court of Appeals Improperly Disregarded the Distinction Between Informal Rulemaking Procedures and Formal Adjudicatory Procedures

Although the AEA does not require a formal hearing, the Commission has interpreted 43 U.S.C. § 2239 (1970) to require informal notice and comment hearings for rulemaking proceedings and formal on-the-record hearings for licensing proceedings. *Siegel,* 400 F.2d at 785.

This distinction has consistently been upheld and found to be important to maintain the necessary flexibility for the agency in selecting the appropriate hearing procedure. *Id.* at 786.

[9] 39 Fed. Reg. 14188 (April 16, 1974). The Commission also indicated that the rule and the data on which it was based would be re-examined from time to time to accommodate new information.

The primary purpose of the APA, as established by this Court, was to "introduce greater uniformity of procedure and standardization of administrative practice . . . ." *Wong Yang Sung* v. *McGrath,* 339 U.S. 33, 41 (1950). The Court of Appeals, in expanding the APA requirements, improperly circumvented this stated purpose.

Further the Court of Appeals ignored this Court's admonition that "[w]hile the line dividing them may not always be a bright one, [there is] . . . a *recognized dictinction* in administrative law between proceedings for the purpose of promulgating policy-type rules or standards, on the one hand, and proceedings designed to adjudicate disputed facts in particular cases on the other." *Florida East Coast Railway,* 410 U.S. at 245 (emphasis added). This Court has stressed that reviewing courts must be alert to the differing standards governing review of an agency's rulemaking authority and its adjudicatory function. *Allegheny-Ludlum Steel Corp.,* 406 U.S. at 749. If this distinction is not maintained and courts create *ad hoc* procedures going beyond the requirements of the APA, "opportunities for caprice and utter unpredictability" will abound. Indeed,

> [I]nsisting on such procedures after the fact, without either constitutional or solid statutory warrant, [is] . . . a kind of *ad hoc* second guessing that can only demoralize conscientious agency officials and undermine the reliability of agency judgments. . . .
>
> So long as the question of whether oral hearings, cross examination, or use of specific interrogatories depends on judges' *post hoc* custom-made notions of "fairness" or "importance," judicial review will seem merely a game of Russian roulette in the Courts of Appeals.

Wright, *Court of Appeals Review of Federal Regulatory Rulemaking,* 26 ADMIN.L.REV. 199 (1974).

The present paralysis in the Commission's regulatory functioning resulting from the Court of Appeals' decisions is a glaring example of the detrimental effects of judicial "*ad hoc* second guessing."

III

THE COURT OF APPEALS INCORRECTLY USED NEPA TO IMPOSE NOVEL AND UNWORKABLE PROCEDURAL REQUIREMENTS ON AGENCY RULEMAKING

In *Natural Resources Defense Council* v. *Nuclear Regulatory Commission,* the Court of Appeals justified its requirements for a "hybrid" proceeding by reference to the "statutory context created by NEPA." 547 F.2d at 645. However, while NEPA requires that an agency consider environmental factors before reaching its decision, it does not stipulate what procedures or format must be used to obtain the necessary input. Environmental factors are but one consideration that an agency such as the Commission is required to assess and weigh objectively in determining the public convenience and necessity. *See Aberdeen & Rockfish Railroad Co.* v. *SCRAP,* 422 U.S. 289, (1975). In addition this Court has recently held that "where a clear and unavoidable conflict in statutory authority exists, NEPA must give way." *Flint Ridge Development Co.* v. *Scenic Rivers Association of Oklahoma,* 426 U.S. 776, 788 (1976).

In evaluating the Commission's actions under NEPA, "[t]he only role for a court is to insure that the agency has taken a 'hard look' at environmental consequences; it cannot 'interject itself within the area of discretion

of the executive as to the choice of the action to be taken.'" *Kleppe* v. *Sierra Club*, 427 U.S. 390, 410 n.21 (1976) (quoting *National Resources Defense Counsel* v. *Morton*, 48 F.2d 827, 838 (D.C. Cir. 1972)).

Just as the courts cannot impose "court devised factors" to dictate the scope and timing of an environmental impact statement, *id.* at 406, neither can the courts devise additional requirements for administrative rulemaking, so long as the agency has complied with the requirements of its governing statutes and the APA. "Such an assertion of judicial authority would leave the agencies uncertain as to their procedural duties under NEPA, would invite judicial involvement in the day-to-day decisionmaking process of the agencies, and would invite litigation." *Id.* The Court of Appeals' use of judicial hindsight to impose vague overbroad requirements on the Commission's rulemaking proceedingse leaves little hope that such proceedings can ever be consumated in an order that would not be subject to reopening. *Interstate Commerce Commission* v. *Jersey City*, 322 U.S. 503, 514-515 (1944).

The danger of such judicial conduct is particularly acute because of the Court of Appeals' broad interpretation of the substantive requirements of NEPA. In *Aeschliman*, for example, the court rejects the "rule of reason" and requires the Commission to undertake an investigation of a "colorable alternative" brought to its attention by an intervenor's comments on a draft environmental impact statement. 547 F.2d at 628. This requirement would reduce the Commission's licensing proceedings to an exercise in mental gymnastics limited only by the scope of the commentor's imagination.

Moreover, it is contrary to well settled limitations on an agency's duty to consider alternatives to its actions. "The requirement is not to explore every extreme possibility which might be conjectured. Rather, . . . NEPA's requirement [is] one of considering alternatives *as they exist and are likely to exist.*" *Carolina Environmental Study Group* v. *United States*, 510 F.2d 796, 801 (D.C. Cir. 1975) (emphasis added). *See also Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 834, 837-38 (D.C. Cir. 1972) ("rule of reason" requires that alternatives must be reasonably available).

IV

AGENCY ACTION IS PRESUMED VALID UNLESS FOUND TO BE ARBITRARY, CAPRICIOUS, AN ABUSE OF DISCRETION OR OTHERWISE NOT IN ACCORDANCE WITH LAW

Where Congress has entrusted the regulation of a given activity to a regulatory agency "[the agency] must be free, within the limitations imposed by pertinent constitutional and statutory commands, to devise methods of regulation capable of equitably reconciling diverse and conflicting interests." *Permian Basin Area Rate Cases*, 390 U.S. 747, 767 (1968). In this regard, the Commission is expressly granted substantial discretion as to how it will proceed. 42 U.S.C. § 2339(a) (1970)[10]. A reviewing court may only set aside agency action when its findings and conclusions are clearly found to be arbitrary, capricious, an abuse of discretion or not otherwise in accordance with law. Barring this, the agency's action is presumed valid and a court may

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[10] Even the Court of Appeals has recognized this discretion and the desirability of this rule in previous decisions. *See, e.g., Ethyl Corp.* v. *EPA*, 541 F.2d 1, 24-27; *Seigel*, 400 F.2d at 786.

not substitute its judgment for the agency. *See Ethyl Corp.* v. *EPA,* 541 F.2d 1, 33-38 (D.C. Cir. 1976) (and cases cited therein).

In making its review of the Commission's decision, the reviewing court must apply a three fold test: (1) whether in light of the relevant facts and of the Commission's broad regulatory duties, the agency abused or exceeded its authority; (2) whether the essential elements of each commission order are supported by substantial evidence; and (3) whether the Commission's orders may be reasonably expected to implement Congressional intent and protect both the existing and forseeable public interests. *Permian Basin Area Rate Cases,* 390 U.S. 747, 791-792 (1968). The Court cannot reweigh the evidence introduced before the Commission nor broaden its scope of review as to the wisdom of the regulations. *Allegheny-Ludlum Steel,* 406 U.S. at 742. Furthermore, it cannot supplant the Commission's balance of public interests with one more nearly to its liking, *Permian Basin Area Rate Cases,* 390 U.S. at 798. Finally, "[t]he focal point for judicial review should be the administrative record already in existence . . . ." *FPC* v. *Transcontinental Pipe Line Corp.,* 423 U.S. 326 (1976).

Yet, in *Natural Resources Defense Council,* the decision of the Court of Appeals was grounded substantially on its own refusal to accept the testimony of Dr. Frank K. Pittman, a witness in the proceedings for the Nuclear Regulatory Commission. Dr. Pittman stated that radioactive wastes could be managed without unreasonable risk to public health and safety. *See* 547 F.2d at 647-653. The court based much of its rejection of the Pittman testimony on articles published after Table S-3 was promulgated without affording Dr. Pittman or any other party an opportunity to respond to these materials. In addition, the Court of Appeals incorrectly concluded that the Commission "uncritically relied on . . . assurances by agency personnel that problems as yet unsolved would be solved." 547 F.2d at 653.

Such statements by the Court of Appeals indicate that it was engaged in a sifting and weighing of the evidence: a substitution of its own judgment for that of the agency's judgment.

Moreover, in relying upon materials published after the development of the administrative record, the Court of Appeals essentially manufactured a new administrative record. Review of administrative decisions is to be confined to "consideration of the decisions of the agency . . . and of evidence upon which it was based." *United States* v. *Carlo Bianchi & Co.,* 373 U.S. 709, 714-715 (1963), quoted in *FPC* v. *Transcontinental Gas Pipe Line Corp.,* 423 U.S. 326, 331 (1976). "[T]he focal point of judicial review should be the administrative record already in existence, not some new record initially made in the reviewing court." *Camp* v. *Pitts,* 411 U.S. 138, 142 (1973).

V

CONCLUSION

By any legal yardstick, the Commission fully complied with both the requirements of the APA and the AEA. In addition, the Commission provided additional procedural safeguards by allowing adequate public input and discussion of issues prior to promulgating Table S-3.

Yet the Court of Appeals has fashioned an infinitely malleable standard of judicial review which will allow a reviewing court to pick and choose at random from the administrative record, or manufacture a new record, to impose its preferences upon the Commission. What both decisions have done is to remove constraints from the scope of judicial review, and permit the court to forage among the administrative records until it finds sustenance for its own predilections. Such a rule works havoc upon the orderly, predictable administrative process; it spawns endless procedural opportunities for litigation, dilatory challenges to agency action.

Set in the context of a severe energy shortage facing the nation, the Appellate Court's decisions seriously freeze the development of an essential energy source and can only aggravate the national energy crisis. This court is urged to affirm the correctness of the agency's decisions and reaffirm the limitations of judicial review of agency actions. In so doing, this Court will cut the legal red tape which threatens to strangle the development of nuclear power as a national energy source.

Respectfully submitted,

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In the Supreme Court of the United States

OCTOBER TERM, 1976

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., ET AL.,
Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF OF *AMICI CURIAE* EDISON ELECTRIC INSTITUTE AND COMMONWEALTH EDISON COMPANY, CONSOLIDATED EDISON COMPANY OF NEW YORK, INC., NIAGARA MOHAWK POWER CORPORATION, OMAHA PUBLIC POWER DISTRICT, POWER AUTHORITY OF THE STATE OF NEW YORK, AND ROCHESTER GAS AND ELECTRIC CORPORATION

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In the Supreme Court of the United States

October Term, 1976

No. 76-419

Vermont Yankee Nuclear Power Corporation,
Petitioner,

v.

Natural Resources Defense Council, Inc., et al.,
Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF OF *AMICI CURIAE* EDISON ELECTRIC INSTITUTE AND COMMONWEALTH EDISON COMPANY, CONSOLIDATED EDISON COMPANY OF NEW YORK, INC., NIAGARA MOHAWK POWER CORPORATION, OMAHA PUBLIC POWER DISTRICT, POWER AUTHORITY OF THE STATE OF NEW YORK, AND ROCHESTER GAS AND ELECTRIC CORPORATION

In accordance with this Court's Rule 42, Edison Electric Institute, *et al.*, have received the written consents of counsel for all parties to file this brief as *amici curiae*. Copies of the consents have been filed with the Clerk of the Court.

INTEREST OF AMICI CURIAE

Edison Electric Institute ("EEI"), and Commonwealth Edison Company, Consolidated Edison Company of New York, Inc., Niagara Mohawk Power Corporation, Omaha Public Power District, Power Authority of the State of New York, and Rochester Gas and Electric Corporation ("the Utilities") have an interest in this Court's disposition of the judgment of the United States Court of Appeals for the District of Columbia Circuit in *Natural Resources Defense Council, Inc. v. Nuclear Regulatory Commission,* 547 F.2d 633 (D.C. Cir. 1976), *cert. granted sub nom. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.,* 45 U.S.L.W. 3570 (U.S. Feb. 22, 1977) (No. 76-419).[1] This interest is demonstrated by the participation by EEI and the Utilities in the rulemaking proceeding before the Atomic Energy Commission[2] reviewed by the court of appeals in the aforementioned opinion, by the participation of the Utilities as *amici curiae* in that review by the court of appeals,[3] by the participation of EEI and the Utilities as *amici curiae* in this Court's consideration of the petition, and by the status of the Utilities and many of

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[1] The slipsheet copy of the opinion is set out at the Appendix to the Petitioners' Briefs ("Pet. App.") 28-88.

[2] URANIUM FUEL CYCLE, USAEC Docket No. RM-50-3, Letter from Arvin E. Upton, Esq., transmitting Written Comments of Alabama Power Company, *et al.* (January 15, 1973); Oral Comments of Arvin E. Upton, Esq., Tr. 12-14, 35, 46-47 (January 17, 1973); Supplementary Written Statement of Alabama Power Co., *et al.* (March 19, 1973).

[3] Brief of *Amici Curiae,* Commonwealth Edison Company, *et al.,* No. 74-1586 (filed D.C.Cir. Dec. 27, 1974) (Pet. App. 8).

EEI's members as licensees and applicants for licenses for nuclear power plants.

EEI is the principal national association of electric utility companies. Its members serve 99.1% of all customers of the investor-owned segment of the electric utility industry and 77.1% of the Nation's electricity users. These member companies are licensees or applicants for licenses for 178 of the 205 commercial nuclear power units currently licensed by, or in licensing before, the Commission.[4] Among EEI's interests are the development of sound policies and procedures for regulation of the construction of nuclear power plants and the production and generation of electricity through the use of nuclear power.

The Utilities include investor-owned and public entities that construct and operate power plants to provide electricity to their customers. Each of the Utilities has an interest in one or more nuclear power plants licensed by, or for which license applications are pending before, the Commission.[5] The Utilities collectively have invested billions of dollars in those plants.[6]

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[4] USNRC, FACILITIES LICENSE APPLICATION RECORD (September 30, 1976). The term "the Commission" is used herein to refer to both the U.S. Atomic Energy Commission ("AEC") and the agency that succeeded to its regulatory responsibilities on January 19, 1975, the U.S. Nuclear Regulatory Commission ("NRC"). 42 U.S.C. §§ 2011-2282 (1970 & Supp. V 1975); Pub. L. No. 93-438, 88 Stat. 1233 (codified in scattered sections of 5, 40, 42 U.S.C.); Exec. Order No. 11,834, 3A C.F.R. 111 (1975), *reprinted in* 42 U.S.C. § 5801 app., at 3866 (Supp. V 1975).

[5] The Utilities hold operating licenses for fourteen nuclear power units (9,075 megawatts ("MWe")), construction permits for seven units (7,736 MWe), and have applications in earlier stages of licensing review for three units (3,477 MWe).

[6] At an estimated value of $680 per kilowatt, the Utilities' nuclear power units represent an investment of approximately $14 billion

SIGNIFICANCE OF THE DECISION BELOW

The court of appeals set aside and remanded the Commission's rule [7] quantifying fuel cycle environmental impacts due to alleged failings in the treatment of certain indirect or secondary environmental impacts of reactor operation, namely, radioactive waste disposal and reprocessing. The lower court also remanded the full-term operating license of the petitioner, Vermont Yankee Nuclear Power Corporation, to await the outcome of further proceedings in the rulemaking.[8] If this decision is allowed to stand, it will have serious consequences by subjecting the Commission and other agencies to an unknowable procedural burden, to an unparalleled requirement for substantive precision in predicting the future, and to a Donnean [9] requirement of breadth in environmental statements. Agency caution would be sure to convert each and every one of these into delays. In combination, the result may approach paralysis. Such delays will have an impact not only on those entities directly involved in nuclear power plant licensing procedures before the Commission, but also on consumers of electricity throughout the country.

BACKGROUND

During the proceedings to determine whether to issue an operating license for the Vermont Yankee

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in 1974 dollars. See USAEC, THE NUCLEAR INDUSTRY 1974, WASH-1174-74 (1974), Table 2-2.

[7] Pet. App. 71.

[8] Pet. App. 40.

[9] JOHN DONNE, DEVOTIONS XVII (1623).

Nuclear Power Station, an intervenor raised the question whether certain environmental impacts associated with the reactor's fuel, but which occur away from the plant site in separately licensed activities, should be part of the Commission's environmental analysis of the power plant pursuant to the National Environmental Policy Act of 1969, as amended ("NEPA").[10]

The Commission's Atomic Safety and Licensing Appeal Board concluded on June 6, 1972, that some such environmental costs should be included but that others should not be included.[11] In particular, the Appeal Board decided to include the impacts of transportation of spent fuel, low-level wastes, and high-level wastes from the reactor to their respective destinations in the cost-benefit analysis of the reactor, but to exclude the environmental impacts of a reprocessing plant and waste disposal facilities. Pet. App. 115.

Five months later the Commission initiated the rulemaking that is the subject of the opinion below. 37 Fed. Reg. 24,191 (1972) (Pet. App. 352). In its notice, the Commission recognized that, in several licensing proceedings, intervenors had raised the question whether the environmental effects of distinct and geographically unrelated activities which comprise the uranium fuel cycle [12] should be included in the cost-benefit an-

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[10] 42 U.S.C. §§ 4321-4347 (1970 & Supp. V 1975); *see* Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109 (D.C. Cir. 1971).

[11] Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), 4 AEC 930 (ALAB 1972) (Pet. App. 112-29); Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), 7 AEC 159 (ALAB 1974) (Pet. App. 130-72).

[12] These activities cover, in industrial sequence, mining of uranium ore, extraction of triuranium octoxide (U_3O_8) from that ore

alysis of each reactor. The Commission went on to state that it was considering a rule to amend its regulations on environmental matters in one of two ways.[13] The first alternative was to exclude the consideration of these fuel cycle activities on the basis that a reactor's annual share of the environmental impacts of the supporting activities is "sufficiently small as not to affect significantly" the decision whether to approve construction and operation of the reactor. Pet. App. 356. The second alternative was to include a calculation of normalized [14] impacts in the environmental statement

in the milling process, conversion of the U_3O_8 to a gas (uranium hexafluoride or UF_6), enrichment (concentration) of the U^{235} contained therein from its natural concentration (approximately 0.711 percent) to approximately 2-4 percent, and then its fabrication as fuel by a) re-conversion into the solid uranium dioxide (UO_2), b) pelletization, and c) insertion into fuel rods for use in the reactor. After the fuel is used in the reactor it may be stored permanently, or reprocessed for the reuse of part and the storage of the remainder.

[13] The participants in the rulemaking were not forbidden from presenting other alternatives. A third alternative was presented and rejected by the Commission. Pet. App. 389-90.

[14] The concept of "normalization" is important to an understanding of the rulemaking. With respect to both the scale and processes of the reactor and the fuel cycle activities, the Commission chose characteristics which were representative of the present industry to emphasize the most severe impact. This results in a conservative (or high) estimate of the overall impact.

An example of this approach is the choice of shorter useful lives for various activities than experience would indicate. This factor alone exaggerates the fixed environmental costs. For example, the land use for each of the supporting activities (except waste management where the commitment was permanent) was exaggerated by estimating a useful life of only 20 years. USAEC, ENVIRONMENTAL SURVEY OF THE NUCLEAR FUEL CYCLE (November 1972) ("Original Environmental Survey") S-1 to S-48 (Pet. App. 539-80); USAEC, ENVIRONMENTAL SURVEY OF THE URANIUM FUEL

on each reactor. That normalized statement of numerical values would cover the various environmental impacts of conducting all the fuel cycle activities which occur beyond the power reactor site boundary. The proposed impact table also would put those numbers in perspective by comparison with the impacts of other more familiar activities, such as coal plants, natural background radiation, and the reactor itself.[15] Pet. App. 358. The technical basis for both alternatives, the 310 page double-spaced Original Environmental Survey, was published at the same time, as the rulemaking notice.

To receive comments on the proposed rule, the Commission appointed a three-member hearing board.[16] All interested persons were invited to submit oral and/or written statements at a legislative "rather than an adjudicatory" hearing to begin on February 1, 1973. Pet. App. 359. The initial written comments were requested by January 14, 1973. Pet. App. 359.

The Commission later issued further procedural instructions directing that the hearing should be "conducted as informally and as expeditiously as practicable, consistent with affording the participants a rea-

CYCLE, WASH-1248 (1974) ("Final Environmental Survey") S-1 to S-33 (Pet. App. 1200-43). As the Commission said in its decision, these calculations were only intended to be descriptive in generating conservative terms and were not intended to be actual costs for any particular reactor and were not intended to set licensing limits. Pet. App. 396.

[15] This comparative approach is in line with the Council on Environmental Quality's Guidelines ("CEQ Guidelines") on the preparation of environmental impact statements. 40 C.F.R. Part 1500 (1976).

[16] The board was appointed by notice at 38 Fed. Reg. 49 (1973) (Pet. App. 361-63).

sonable opportunity to present their positions." Pet. App. 362. In addition, the Commission said that both oral and written statements would be "subject to questioning" by the board. *Id.* The board was empowered to hold one or more procedural planning sessions; such a session was held on January 17, 1973. Then the board was to hold an oral hearing and, after allowing thirty days further for the submission of supplementary written statements, the board was to forward the entire record to the Commission accompanied by an identification of the issues but without any recommendation or initial decision from the board. The Commission itself would make the decision. Pet. App. 363. The oral hearing was held on February 1 and 2, 1973; all parties were allowed the full time for oral presentation which they requested.[17]

The respondents in this Court requested, and were granted, an extension of time in which to file their supplemental written statement.[18] On July 6, 1973, the board forwarded the record and its report identifying nine issues to be considered by the Commission. Pet. App. 364-78.

On April 16, 1974, the Commission issued the final rule accompanied by a 260 page single-spaced Final Environmental Survey to take account of information made available during the rulemaking. 39 Fed. Reg. 14,188 (1974) (Pet. App. 385-99). The Commission briefly discussed all issues identified by the board and

[17] URANIUM FUEL CYCLE, USAEC Docket No. RM-50-3, Tr. 9-26 (Jan. 17, 1973).

[18] URANIUM FUEL CYCLE, USAEC Docket No. RM-50-3, Motion of Consolidated National Intervenors/Union of Concerned Scientists in Request of Schedule Rearrangement (Feb. 27, 1973) and Order Granting Extension of Time (Mar. 9, 1973).

concluded that, although the sum of these fuel cycle costs is "relatively insignificant" in the consideration of whether to license a power reactor, it would adopt the second alternative because "it quantifies, to the fullest extent practicable, the environmental effects of the uranium fuel cycle in individual cost-benefit analyses." Pet. App. 395-96.

The respondents in this Court filed a petition for review of the final rule in the court of appeals on June 7, 1974. That proceeding was consolidated with the petition for review of the Vermont Yankee license, and oral argument was held May 27, 1975. The decision below, which is the subject of the writ of certiorari, issued July 21, 1976.

SUMMARY OF ARGUMENT

The initial question before the Court is whether the Commission was correct in excluding fuel cycle impacts from the NEPA consideration of the Vermont Yankee operating license. The *amici* suggest that the Commission was correct since those impacts occur at facilities geographically distant from the reactor, separately licensed by the Commission at different times, and require separate NEPA statements in accordance with the licensing scheme of the Atomic Energy Act.

However, if the Commission was not free for those reasons to exclude fuel cycle impacts as a matter of law, the subsequent rulemaking provided an appropriate basis for excluding those impacts as insignificant in the NEPA consideration of a power reactor license. The rulemaking record was substantively adequate for this determination due to the full consideration of available information by the Commission in an exercise of its technical expertise. The legislative procedures used in that rulemaking were also adequate for the determination of such facts for such a purpose, and adjudicatory procedures would have been inappropriate.

ARGUMENT

I. THE COMMISSION WAS CORRECT IN DECIDING TO EXCLUDE FUEL CYCLE IMPACTS FROM THE NEPA CONSIDERATION OF THE VERMONT YANKEE OPERATING LICENSE.

The Commission's Atomic Safety and Licensing Appeal Board concluded on June 6, 1972, that the impacts of transportation of spent fuel, low-level wastes, and high-level wastes from the reactor to their respective destinations should be included in the cost-benefit analysis of the reactor, but the environmental impacts

of a reprocessing plant and waste disposal facilities should be excluded. Pet. App. 115. The court below disagreed; it decided that the environmental impacts of all fuel cycle facilities must be included. Pet. App. 33-40.

Thus, this Court is presented with the question whether the decision to license a particular reactor is related to the decision to license fuel cycle facilities[19] so intimately, necessarily, and definably that the fuel cycle activities are part of the same major Federal action and, therefore, need to be considered in the NEPA statement on each reactor. The statutory and regulatory structure for licensing, the advice of the CEQ, and this Court's prior decisions all dictate a negative answer to this question.

The Commission's authority to issue licenses was established under the Atomic Energy Act of 1954, as amended ("Atomic Energy Act"). 42 U.S.C. §§ 2011-2282 (1970 & Supp. V 1975). That authority is stated separately according to whether the applicant for a license seeks to possess and use source material, by-product material, special nuclear material, or a utilization or production facility.[20] 42 U.S.C. §§ 2091-99, 2111-

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[19] Fuel cycle facilities are those which mine, mill, convert, enrich and fabricate uranium for use as fuel, in the reactor as well as these facilities which may reprocess that uranium and/or store it after use in the reactor. *See also* note 12, *supra*.

[20] In the Energy Reorganization Act of 1974, Congress established a specific requirement for the licensing of the Federal long-term storage of high-level radioactive waste activities and recognized that such long-term storage facilities do not exist. 42 U.S.C. §§ 5842(3) and (4) (Supp. V 1975); H.R. Rep. No. 93-1445, 93d Cong., 2d Sess. 34 (1974). There was no hint that power reactor licensing or any other licensing should in any way be dependent on these separate licensing activities for long-term high-level waste management activities.

12, 2061-78, 2131-40 (1970 & Supp. V 1975); 10 C.F.R. Chapter I (1977). The Atomic Energy Act also recognizes that a particular activity may require a license covering more than one of these conceptual categories. 42 U.S.C. § 2201(h) (1970). However, in each case, the findings to be made relate to the activity or activities for which the license is sought and the Commission makes its determination whether to issue the license on the basis of the information in the application for that license as required by statute. *E.g., Power Reactor Development Co. v. International Union of Electrical, Radio and Machine Workers,* 367 U.S. 396 (1961); 10 C.F.R. § 50.57 (1977).

The Commission's regulations governing the preparation of NEPA statements demonstrate that the licensing of each type of fuel cycle activity is considered a major Federal action and therefore an impact statement will be prepared. 10 C.F.R. § 51.5 (1977).

The scope of consideration in each of those NEPA statements should be coterminous with the scope of the individual license. *Friends of the Earth v. Coleman,* 513 F.2d 295, 300 (9th Cir. 1975).

This Court's decision in *Kleppe v. Sierra Club,* 427 U.S. 300 (1976), confirms that approach. In that decision, the Court found that it was appropriate to have environmental impact statements for individualized "local actions" distinct from any statement that would be required for a "new national coal leasing program." 427 U.S. at 399-400. In this case, the major Federal action is an individual local one, namely, the licensing of a single nuclear power plant, Vermont Yankee Nuclear Power Station. The Court in *Kleppe* recognized that such individual actions are subject to separate NEPA statements, regardless of the timing or

existence of a statement of larger scope. 427 U.S. at 414 n.26.

The Atomic Energy Act's directive to license private nuclear activities does not require an environmental statement. While the national coal program is a new program authorized by the Executive Branch in the post-NEPA period, the licensing of the nuclear fuel cycle activities, including nuclear power reactors, was established by Congress prior to NEPA and this scheme of license by license consideration has been reaffirmed by Congress subsequent to NEPA.[21] It is only for Congress to reconsider this licensing scheme. As one of the counsel for certain respondents in this matter recognized in extensive testimony before Congress in 1974,

> [t]hese decisions on whether or not to go ahead with nuclear power, whether to have a breeder, whether nuclear waste disposal is such a problem that it cannot be dealt with and, therefore, in and of itself poisons the nuclear industry, are all *questions that have ultimately to be resolved by Congress.*

Nuclear Power Plant Siting and Licensing: Hearings on H.R.11957, H.R.12823, H.R.13484 and S.3179 before the Joint Comm. on Atomic Energy, 93rd Cong., 2d Sess. 77-140 (1974) (quoted material at 89; *accord,* 129) (emphasis added). The same witness, in recommending the establishment of a "blue ribbon panel" for debate on this and other issues, admitted in effect that the licensing of individual reactors did not provide a "forum" for this issue and that the issue was not appropriate to such individual reactor licensing actions. *Id.* at 95, 127-29.

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[21] Pub. L. No. 93-438, 88 Stat. 1233 (codified in scattered sections of 5, 40, 42 U.S.C.).

Since Congress established by statute this scheme of license by license consideration, the Court should find that the licensing of an individual power reactor is a separate major Federal action, distinct from those involved in the licensing of other fuel cycle activities and that, therefore, its environmental statement is properly limited to the proposed reactor's direct impacts and geographically related indirect impacts. *See Conservation Society of Southern Vermont, Inc. v. Secretary of Transportation,* 531 F.2d 637 (2d Cir. 1976), *on remand from Coleman v. Conservation Society of Southern Vermont, Inc.,* 423 U.S. 809 (1975), *vacating, Conservation Society of Southern Vermont, Inc. v. Secretary of Transportation,* 508 F.2d 927 (2d Cir. 1974); 40 C.F.R. § 1500.8(a)(3) (1976).

This is not to say that Congress will lose the benefit of NEPA statements on the fuel cycle activities. *See* Pet. App. 38 n.15. The Commission has prepared NEPA statements for each major Federal action it takes, and its regulations assure that this process will continue.

This analysis is also consistent with the expansive advice of CEQ on the preparation of environmental impact statements, including the extent to which such statements should consider the indirect consequences of major Federal actions.[22] *See* 40 C.F.R. Part 1500 (1976). Those guidelines recognize that

> [S]econdary effects, through their impacts on existing community facilities and activities, through

[22] "[T]he CEQ guidelines are advisory, not mandatory. Greene County v. F.P.C., 455 F.2d 412 [,421] (2d Cir., 1972)." Continental Ill. Nat. Bank & Trust Co. of Chicago v. Kleindienst, 382 F. Supp. 107, 114 (N.D. Ill. 1973); *accord,* Sierra Club v. Lynn, 503 F.2d 43, 58 (5th Cir. 1974), *cert. denied,* 421 U.S. 994 (1975); *compare* 42 U.S.C. § 4332 (2)(B) (1970) *with* 115 CONG. REC. S12,146 (daily ed. Oct. 8, 1969) (proposed version of that section).

> inducing new facilities and activities, or through changes in natural conditions, may often be even more substantial than the primary effects of the original action itself. For example, the effects of the proposed action on population and growth may be among the more significant secondary effects. Such population and growth impacts should be estimated if expected to be significant . . . and an assessment made of the effect of any possible change in population patterns or growth upon the resource base, including land use, water, and public services, *of the area in question.*

40 C.F.R. § 1500.8(a)(3)(ii) (1976) (emphasis added). This guideline indicates that secondary impacts are those which are not direct but which are geographically related to the major Federal action under consideration. A review of the Commission's impact statements will demonstrate that they do in fact consider such secondary impacts.[23] However, not even the CEQ suggests that it is appropriate to consider tertiary impacts, that is, indirect impacts unrelated geographically, especially where they constitute separate major Federal actions and will, therefore, be subject to separate impact statements.

Not only are the other nuclear fuel cycle activities geographically unrelated to the power plant and subject to separate licensing actions requiring independent NEPA impact statements, but also they are proposed and acted on at distinct times, conducted by

[23] *E.g.,* NRC, FINAL ENVIRONMENTAL STATEMENT RELATED TO THE CONSTRUCTION OF MARBLE HILL NUCLEAR GENERATING STATION UNITS 1 AND 2, Public Service Company of Indiana, Inc., *et al.* (Docket Nos. STN 50-546, STN 50-547) (September 1976); *see* NRC, REGULATORY GUIDE 4.2, REVISION 1, PREPARATION OF ENVIRONMENTAL REPORTS FOR NUCLEAR POWER STATIONS (January 1975).

different persons, and subject to distinct technical and environmental requirements.

II. THE RULEMAKING DETERMINATION PROVIDED AN ADEQUATE FACTUAL BASIS FOR THE EXCLUSION OF FUEL CYCLE IMPACTS FROM THE NEPA CONSIDERATION OF INDIVIDUAL REACTOR LICENSES.

The inquiry made by the Commission in the rulemaking was an interstitial environmental assessment to determine whether the indirect impacts of the nuclear fuel cycle should be included in the cost-benefit balance and in the consideration of alternatives in the licensing of individual nuclear power reactors. *See* 40 C.F.R. § 1500.6 (1976); *Calvert Cliffs' Coordinating Committee, Inc. v. AEC,* 449 F.2d 1109 (D.C. Cir. 1971); 42 U.S.C. § 4332(2)(C)(iii) (1970).

As discussed in greater detail below, the inquiry conducted by the Commission was procedurally and substantively adequate for that purpose and the Commission's conclusion that those fuel cycle impacts are "relatively insignificant" in the NEPA consideration of a reactor was correct. On that basis, the fuel cycle impacts could have been excluded. Pet. App. 395. If the Commission erred at all in its eagerness to fulfill the purposes of NEPA, it erred by including the quantification of its estimates in individual reactor environmental impact statements.

That quantification is now included in the cost-benefit balance for the reactor and thus affects the consideration of possible electric generation alternatives, with their fuel cycles.[24] However, the Commission did

[24] For example, the coal "fuel cycle" includes mining, removal of impurities prior to burning, burning, removal of particulates and sulphur dioxide during the burning process, disposal of ash and, if flue gas desulphurization devices are used, disposal of sludge.

not attempt to state any of the *benefits* accruing from nuclear fuel cycle activities.[25] Nor did the Commission attempt to quantify the *costs* or *benefits* of the alternative fuel cycles. The Commission concluded that even a cost-benefit analysis so-tilted against the nuclear alternative would nonetheless be unlikely to change a decision otherwise favorable to the licensing of the nuclear power plant. *A fortiori,* inclusion of the benefits of the nuclear fuel cycle and consideration of the costs and benefits of alternative fuel cycles would, logically, reduce the already negligible significance of considering nuclear fuel cycle impacts to a point approaching zero. Perhaps it might even result in an analysis more favorable to the nuclear power plant.

To necessitate a NEPA statement, a Federal action must be a major one that is also significant in impact. If an agency through preliminary examination of a proposed action concludes that its impact is insignificant, a NEPA statement is unnecessary. In reaching a negative assessment of the impact, the agency must take a "hard look" at the proposed action, identify the areas of potential concern, and substantiate its conclusions of insignificance with a statement of its rationale discussing the elements considered. *Maryland-National Capital Park and Planning Commission v. U.S. Postal Service,* 487 F.2d 1029 (D.C. Cir. 1973). The precise definition of significance has been left by Congress to the good faith of the agency involved. *Hanly v. Kleindienst,* 471 F.2d 823, 830 (2d Cir. 1972), *cert.*

[25] Arguably, the benefits of the fuel cycle activities should also have been considered. *Cf.*, Hiram Clarke Civic Club, Inc. v. Lynn, 476 F.2d 421, 426-27 (5th Cir. 1973). However, this possible failure was at most harmless error since consideration of the benefits would only have added weight to a decision already favorable to reactor licensing.

denied, 412 U.S. 908 (1973) ("*Hanly II*"). The reviewing courts have required that the impact of the action be insignificant relative to existing activities and that the impact not be "the straw that breaks the back of the environmental camel." 471 F.2d at 831.

The insignificance of the impact may be obvious, allowing almost conclusionary statements,[26] or it may require considerably more investigation and deliberation[27] before finally being accepted. In reviewing such investigations of impact, courts have recognized the agency's need for flexibility of procedure. The only standards have been functional: the agency is to consider all relevant issues and reach its decision in a manner permitting comprehension of its rationale.

By analogy, an agency should be able to exclude from a NEPA statement consideration of distant indirect impacts, at least where they are determined to be insignificant. Indeed, "it is entirely unreasonable to think that Congress intended for an impact statement to document every particle of knowledge that any agency might compile in considering the proposed action." *Environmental Defense Fund v. Corps of Engineers*, 492 F.2d 1123, 1136 (5th Cir. 1974). The CEQ guidelines also support this position by requiring that indirect impacts need be considered only "if expected to be significant" in and of themselves. *See* 40 C.F.R. § 1500.8(a)(3)(ii) (1976) ("population and growth impacts"). The record of this proceeding satisfies the "hard look" rule and provides an adequate substantive basis for the conclusion of "insignificance", as discussed within Argument III, *infra*.

[26] Hanly v. Mitchell, 460 F.2d 640, 645-46 (2d Cir. 1972), *cert. denied*, 409 U.S. 990 (1972) ("*Hanly I*") (one page negative assessment sufficient for office building).

[27] *E.g.*, an assessment for a jail was remanded twice for additional consideration and examination. *Hanly I*; *Hanly II*; Hanly v. Kleindienst, 484 F.2d 448 (2d Cir. 1973).

III. THE BASIS IN THE RECORD FOR THE COMMISSION'S NEPA DESCRIPTION OF FUEL CYCLE IMPACTS IS ADEQUATE.

The court below found that the Original Environmental Survey alone would support the Commission's conclusions on the fuel cycle activities, other than the long-term storage of high-level radioactive waste and reprocessing, without resort to the oral and written testimony. Pet. App. 51-52.

With respect to the long-term storage of high-level radioactive wastes, the court of appeals devoted a major part of its opinion to a discussion of the lack of detailed information on the facilities and of the absence of a "genuine dialogue" or adversary debate about the "basic philosophical issues concerning man's ability to make commitments which will require stable social structure for unprecedented periods." Pet. App. 67, 63. The decision below also said that the Commission had inadequately articulated its reasoning and failed to specify the evidence on which it relied. Pet. App. 64. However, the principal specific criticism of the record was withdrawn by the court in its order of October 8, 1976, correcting the opinion. Pet. App. 87-88.

With respect to the alleged inadequacy of the Commission's findings on the impact of reprocessing, the decision below contains nothing but a conclusory statement of inadequacy.[27]

[27] In Part III of the opinion below (which deals with the rulemaking), the court of appeals mentioned the word "reprocessing" seven times and gave only one hint why the treatment of reprocessing was deemed inadequate. Pet. App. 51 (twice), 55, 60 (twice),

These conclusions are inconsistent with this Court's directives on how a reviewing court should determine whether there is sufficient support in the record for an agency's decision. Further, the decision below places a burden on the Commission to provide information for NEPA consideration which is contrary to the interpretation of NEPA by the courts.

> The adequacy of an [impact statement] can only be considered in light of its purpose. "The primary purpose of the impact statement is to compel federal agencies to give serious weight to environmental factors in making discretionary choices."

Chelsea Neighborhood Associations v. U.S. Postal Service, 516 F.2d 378, 386 (2d Cir. 1975), quoting *Monroe County Conservation Council v. Volpe,* 472 F.2d 693, 697 (2d Cir. 1972). Measured against this standard, the Commission's rulemaking is clearly adequate. The Commission based its final conclusions on the full rulemaking docket and on its expertise. *See Aberdeen & Rockfish R.R. v. Students Challenging Regulatory Agency Procedures,* 422 U.S. 289, 320-21 (1975) ("*SCRAP II*"). The Commission's rulemaking decision has as its basis the 260 page single-spaced Final Environmental Survey, the written comments of 46 participants and the Regulatory Staff, the 520 page transcript of the oral proceedings, all documents ref-

62, 68, and 71. In footnote 51, the opinion cites a government report issued one year *after* the final rule which stated that " 'there are still many technical problems and uncertainties in the overall area of reprocessing of spent fuel and properly managing its radioactive waste.' " Pet. App. 60. The fact that there are "technical problems and uncertainties" does not vitiate the ability of the Commission to make an adequate estimate of the environmental effects of reprocessing, on the basis of its experience, for the purpose of NEPA disclosure.

erenced in the foregoing, the board's report to the Commission, and finally, the 4,000 word Statement of Consideration issued by the Commission with the final rule. These materials included supplementary information filed to correct the "deficiency," suggested by one board member, in the waste management discussion in the Original Environmental Survey.

In its Statement of Consideration, the Commission addressed all nine issues identified by the board in an adequate, if brief, fashion. Pet. App. 388-97. The opinion of this Court in *Camp v. Pitts,* 411 U.S. 138, 143 (1973), indicates that while the agency is required to state its rationale, that statement may even be "curt." The agency is not required to state its findings in the detail required of a trial judge sitting without a jury; rather the reviewing court is to survey the "administrative record" as a whole. 411 U.S. at 142.

The court of appeals has previously held that there is "some degree of flexibility and agency discretion in determining the content of impact statements." *Scientists' Institute for Public Information, Inc. v. AEC,* 481 F.2d 1079, 1091 (D.C. Cir. 1973) ("*SIPI*"), and that "[t]he statute must be construed in the light of reason if it is not to demand what is, fairly speaking, not meaningfully possible . . . ." *Natural Resources Defense Council, Inc. v. Morton,* 458 F.2d 827, 837 (D.C. Cir. 1972). Thus, the court of appeals in *SIPI* found that NEPA requires only "a good faith effort in the survey to describe the reasonably foreseeable environmental impact of the program." 481 F.2d at 1092. This Court emphasized those principles in *Kleppe,* 427 U.S. at 402 n.14, where it recognized that there must be "appropriate allowances for the inexactness of all predictive ventures." These decisions indi-

cate that it is appropriate to rely upon a lesser level of detail in the record for direct impacts of a project than the court below would require for indirect impacts stated in a normalized format.

As to the impacts of both reprocessing and long-term wastes attributable to a hypothetical reactor, the court below said that the "kind of detailed explanation and support for the staff's conclusions [for the other phases of the fuel cycle] was noticeably absent from the Environmental Survey *as originally published.*" Pet. App. 51-52 (emphasis added). However, this ignores the true question: the sufficiency of detail in the Final Environmental Survey and the entire administrative record.[29] Further, the sufficiency of the record on these two fuel cycle activities should be judged in the light of the type of factual information available on reprocessing and long-term storage of high-level waste at that time. The court below has either ignored the present state of development or would require the presentation of detailed information despite the fact that no such information yet exists.

[29] There was a considerable difference between the Original and Final Environmental Surveys in the degree of detail afforded the discussion of reprocessing and waste management. *Compare* Original Environmental Survey, Table S-3A and Chapters F and G (Pet. App. 538-625), *with* Final Environmental Survey, Table S-3A and Chapters F and G (Pet. App. 1194-1319). For example, in volume terms, the original devoted 58 double-spaced pages to the discussion of these subjects while the final had 61 single-spaced pages of discussion. And while, in the Original Environmental Survey, the Commission had discussed explicitly only its limited experience with the civilian nuclear fuel cycle, the Final Environmental Survey also discussed and relied on the more extensive experience in the Government's military reprocessing and waste management since the 1940's. *See* Final Environmental Survey, F-15 through F-19. *See* SCRAP II, 422 U.S. at 321.

The lack of complete knowledge "does not necessarily undermine the adequacy of the statement." *Cady v. Morton,* 527 F.2d 786, 796 (9th Cir. 1975), *citing Jicarilla Apache Tribe of Indians v. Morton,* 471 F.2d 1275, 1280 (9th Cir. 1973). "If the court were to rule that the Defendants must perform all possible research on the environmental effects of [a project], the project could be postponed indefinitely, perhaps forever." *Brooks v. Volpe,* 350 F. Supp. 269 (W.D. Wash. 1972), *aff'd,* 487 F.2d 1344 (9th Cir. 1973).

Only one civilian reprocessing facility had ever operated (two were in the licensing process). and no permanent long-term high-level waste storage facility had been built. Pet. App. 36, 54-55. Thus, the conclusions of the staff witnesses and, ultimately, the Commission as to those two stages of the fuel cycle were necessarily based, to a great degree, on judgment and conceptual analysis. In contrast, there were 222 mines (Original Environmental Survey, B-7), two conversion plants with a total production of 10,000 metric tons per year (Original Environmental Survey, C-2), three enrichment plants that had operated for nearly 70 plant years[30] (Original Environmental Survey, D-1), and ten fuel fabrication plants (Original Environmental Survey, E-7).

In reaching its conclusions with respect to the impacts of reprocessing, the Commission relied on its experience with the operation of the one plant and the design and construction of the other two (Final Environmental Survey, Section F) (Pet. App. 1243-91), as well as the extensive experience since the 1940's with

[30] USAEC, AEC Gaseous Diffusion Plant Operations, (ORO-684) 11-13 (January 1972).

high-level wastes in the Government program, and gave only minimal credit for currently developing improvements in technology (Final Environmental Survey, S-2) (Pet. App. 1200-43). Further, the Commission took specific account of the respondents' criticisms of the reprocessing calculations in the Final Environmental Survey and recognized them in its Statement of Consideration. Pet. App. 393 n.3.

The Commission's estimate of the impacts of long-term high-level waste storage were perforce made on the basis of design concepts and analyses, but NEPA requires no more. The court below failed to recognize that the Commission was not considering the approval of a lon,-term waste storage facility, and thus the "factual predicate" necessary for detailed analysis was absent. *Cf., Kleppe,* 427 U.S. at 402; *Natural Resources Defense Council, Inc. v. Morton,* 458 F.2d at 837. Rather, the Commission was making descriptive estimates from experience with the storage of high-level wastes in the Government program, as well as at the only civilian reprocessing plant to have operated to date, and it relied on that experience. Pet. App. 393 n.3. Such wastes will be kept at the reprocessing plant until a long-term storage facility is constructed by the Energy Research and Development Administration and licensed by the Commission.[31] Until a definite design and location is proposed, one cannot determine answers to the questions about the details of high-level waste management posed by the court below.[32] Nor does NEPA require such answers. "Certainly NEPA does not require the Commission to

[31] The Commission's regulations currently require this approach. 10 C.F.R. Part 50, App. F (1977).

[32] *See* Kleppe v. Sierra Club, 427 U.S. at 401-02.

forecast the deployment and effects of LMFBR power reactors in the year 2000 in the same detail or with the same degree of accuracy as another agency might have to forecast the increased traffic congestion likely to be caused by a proposed highway." *SIPI,* 481 F.2d at 1092. This Court recognized in *Kleppe,* 427 U.S. at 414, that "practical considerations of feasibility might well necessitate restricting the scope of comprehensive statements." Such practical considerations also should be used to allow the agency discretion to determine the appropriate level of detail of consideration, especially where the subject requires "a high level of technical expertise." *See* 427 U.S. at 412. If specific details cannot yet be determined, the courts have allowed agencies greater leeway in EIS preparation. *Sierra Club v. Lynn,* 502 F.2d 43 (5th Cir. 1974), *cert. denied,* 421 U.S. 994 (1975) (licensing of residential development in environmentally sensitive area); *Union of Concerned Scientists v. AEC,* 499 F.2d 1069 (D.C. Cir. 1974) (reactor licensing); *Sierra Club v. Morton,* 510 F.2d 813 (5th Cir. 1975) (OCS oil leases). "NEPA does not require that every federal decision be verified by reduction to mathematical absolutes for insertion into a precise formula." *Sierra Club v. Lynn,* 502 F.2d at 61. "The preparation of such a statement necessarily calls for judgment, and that judgment is the agency's." *Lathan v. Brinegar,* 506 F.2d 677, 693 (9th Cir. 1974). *Cf. Kleppe,* 427 U.S. at 414.

The Commission and the Energy Research and Development Administration are currently pursuing their respective licensing and management responsibilities for high-level wastes and reprocessing. More

detailed environmental treatment will be accorded these subjects in those "more appropriate" proceedings. *See SCRAP II,* 422 U.S. at 322-28.

Congress has over the years held hearings to monitor carefully the continuing developments with respect to radioactive wastes, and in particular high-level wastes.[33] In 1959 alone, such hearings covered over 3000 pages.[34] Regularly those hearings have reviewed the progress of the Government's military waste management as well as licensing developments.[35] In considering the Energy Reorganization Act of 1974, Congress was told by at least one witness that "present nuclear power plant construction plans, which imply accumulation of more radioactive wastes, should be halted until a proven method for safely storing radioactive wastes is available." [36] However, the Chairman of the Commission submitted testimony that there was at least one "thoroughly proven, safe, flexible technique" already available and others were under development and consideration.[37] In the conclusion of

[33] *Hearings on Chemical Reprocessing Plant before the Joint Comm. on Atomic Energy,* 88th Cong., 1st Sess. (1963).

[34] *Hearings on Industrial Radioactive Waste before the Joint Comm. on Atomic Energy,* 86th Cong., 1st Sess. (1959) (*"1959 Hearings"*).

[35] *1959 Hearings* 2509-31; *Hearings on Radioactive Waste Management before the Subcomm. on Environmental Safety of the Joint Comm. on Atomic Energy,* 94th Cong., 2d Sess. (1976).

[36] *Hearings on S.2744 before the Subcomm. on Reorganization, Research, and International Organizations of the Senate Comm. on Government Operations,* 93d Cong., 1st Sess. 213 (1973).

[37] *Hearings on S.2135 and S.2744 before the Subcomm. on Reorganization, Research, and International Organizations of the Senate Comm. on Government Operations,* 93d Cong,. 2d Sess. 338 (1974).

this overview, the Chairman stated that there would be "high assurance that there is minimum hazard to future generations from these activities." Congress did not decide to halt power reactor licensing, but rather decided to require the Commission to license Federal long-term high-level commercial waste facilities which Congress recognized were not in existence and probably would not be until some future time "probably in the 1980's." S. REP. No. 93-980, 93d Cong., 2d Sess. 60 (1974).

Also in 1976, the Joint Committee on Atomic Energy issued a report which states as one of its "Conclusions" that, "on the whole, the potential difficulties which may be encountered in the radioactive waste management program do not pose risks to the public of such magnitude that this Nation should forego its nuclear energy program . . . ." AD HOC SUBCOMM. TO REVIEW THE LIQUID METAL FAST BREEDER REACTOR PROGRAM, REVIEW OF NATIONAL BREEDER REACTOR PROGRAM, 94th Cong., 2d Sess. 12, 79 (Joint Comm. Print 1976).

The estimate given by the Commission based on its expertise and experience with military and civilian high-level wastes was sufficient for the task at hand. *Industrial Union Department v. Hodgson,* 499 F.2d 467, 474 (D.C. Cir. 1974); *cf. Kleppe,* 427 U.S. at 402 n.14. The Commission has had experience with the management of high-level wastes since the 1940's. The current inventory of high-level wastes from the Government programs is approximately 75.6 million gallons, or more than *ten times* the amount of such waste that will be generated by the entire civilian nuclear power industry by the year 2000. *ERDA Authorizing*

[38] *Id.,* at 347.

Legislation Fiscal Year 1977: Hearings Before the Subcomm. on Legislation of the Joint Comm. on Atomic Energy, Part 2, 94th Cong. 2d Sess., Chart VII at 1460, 1464 (1976).

It is to be hoped that the court of appeals is not correct in assuming that the assessment of environmental impacts must entertain philosophical debates as to whether our society will remain stable for 250,000 years. Pet. App. 63. Such an exercise would surely be a sally into the unforeseeable. *See SIPI,* 481 F.2d at 1092. The Commission satisfied NEPA when it described the radionuclides and other impacts, including the commitment of land as "permanent."[39] The court of appeals has approved a Commission rule which excludes considerations of war from the health and safety review of reactors. *Siegel v. AEC,* 400 F.2d 778, 784 (D.C. Cir. 1968). If the Commission can exclude from consideration such a drastic condition, which is nonetheless within our experience, in carrying out its basic health and safety responsibilities, it can surely decline to debate whether the Constitution will endure for 250,000 years.

IV. THE COMMISSION'S PROCEDURES WERE ADEQUATE FOR THE DETERMINATION TO BE MADE

The Commission initiated a rulemaking under Section 161 of the Atomic Energy Act to determine whether (a) the fuel cycle impacts "are sufficiently small as not to affect significantly" a power reactor's cost-benefit analysis and, therefore, may be excluded from consideration or (b) the fuel cycle impacts should be included in the Commission's NEPA statement according to Table S-3. 42 U.S.C. § 2201 (1970); Pet. App.

[39] *See* Table S-3 (Pet. App. 400).

352-60. Pursuant to Section 181 of the Atomic Energy Act, such a rulemaking is subject to the requirements of the Administrative Procedure Act. 42 U.S.C. § 2231 (1970); 5 U.S.C. §§ 501-03, §§ 551-59, §§ 701-06 (1970 & Supp. V 1975). *See United States v. Allegheny-Ludlum Steel Corp.,* 406 U.S. 742 (1972); *United States v. Florida East Coast Railway,* 410 U.S. 224 (1973).

The Commission, in its notice of rulemaking, announced that it would receive oral and written comments and that the hearing would be "legislative-type," not "adjudicatory." Pet. App. 359. In its Statement of Consideration accompanying the final rule, the Commission offered "further clarification": "Neither the effective amendment nor the Environmental Survey state or imply that the values in the Summary Table are to be imposed as operating limits on present and future fuel cycle facilities." Pet. App. 396. Thus the facts determined will not control the licensing of fuel cycle facilities and will not affect the likelihood of the grant or continuance of such licenses, or the cost of the design, construction, or operation of such facilities. The only effect of the instant rulemaking was to establish generalized legislative facts for the limited purpose of establishing part of the cost-benefit analysis in the Commission's NEPA statements for power reactors.

Given these facts, this Court must determine whether the procedures used by the Commission were adequate for this purpose. Some may urge that, since the Commission was indeed conducting no more than an interstitial environmental assessment, a rulemaking was entirely unnecessary and the Commission could have determined not to include the fuel cycle impacts without obtaining any public comment. *See* 10 C.F.R. § 51.7

(1977); *see also* 40 C.F.R. § 1500.6 (1976). Others may go to the opposite extreme by urging the Court to hold that adjudicatory procedures were required for this rulemaking. However, the Commission chose not to pursue the strictly internal method of determination and elaborate adjudicatory procedures were simply inappropriate to the task at hand.

The task at hand was the formulation of an expert judgment, for a limited purpose, of the average environmental impacts of eight different nuclear activities, given a variety of assumptions for the useful life and relative scale of plant, the annual fuel consumption of power reactors, and the available environmental protective devices applied in each activity. Especially in reprocessing and waste management activities, the assessment of these factors required the exercise of expert judgment rather than the precision in fact analysis sought by adjudicatory procedures. Clearly NEPA requires no special procedures but rather may be fulfilled through the normal procedures utilized by the agency in carrying out its substantive responsibilities. *Union of Concerned Scientists,* 499 F.2d at 1078-79. Nor is there anything unusual about an agency, especially one with "broad responsibility . . . free of close prescription" such as the Commission, relying on expert judgment in finding such normalized facts as the indirect impacts involved here, rather than insisting upon cross-examination before doing so. *See Siegel,* 400 F.2d at 783.

While the court below claimed that it did not "intrude on the agency's province by dictating to it which, if any, of [certain] procedural devices it must adopt to flesh out the record," it did so intrude by holding

that an oral proceeding would be required on remand. Pet. App. 67, 69 n. 62. The opinion immediately reiterates that it does "not intimate that [the Commission] must adopt any of" the procedures set out in note 41, *infra.* However, this avails little in the face of the holding that oral proceedings are required.

In his "separate statement concurring in result," Judge Tamm wrote: "More procedure will not, in this case, guarantee a better record, and a better record can be generated without reopening the oral proceeding at this time." Pet. App. 80. In the "Opinion for the Court," Chief Judge Bazelon held:

> Evidently Judge Tamm would permit Dr. Pittman to supplement his testimony without giving those who disagree an opportunity to criticize or comment on the new material (*e.g.,* 'without reopening the oral procedings,' Concur at 3). *We would not agree.*

Pet. App. 69 n.62 (emphasis added). The conclusion that oral proceedings are necessary to the rulemaking rejects the flexibility accorded to agencies by Section 553 of the Administrative Procedure Act to have notice and comment procedures "with or without opportunity for oral presentations." 5 U.S.C. § 553(c) (Supp. V 1975).

This holding flatly usurps the discretion accorded the Commission under its own statute [40] and the Administrative Procedure Act,[41] which discretion has been recognized by the same court of appeals. *See, e.g., Siegel,* 400 F.2d at 783-86.

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[40] 42 U.S.C. § 2239(a) (1970).

[41] 5 U.S.C. § 553 (1970 & Supp. V 1975).

The opinion below did not stop there: it went on to enumerate most, if not all, of the significant procedural devices developed in the history of the common law[42] and concluded "[i]t may be that no combination of the procedures mentioned above will prove adequate, and *the agency will be required to develop new procedures* to accomplish the innovative task of implementing NEPA through rulemaking." Pet. App. 67 (emphasis added). This observation was coupled with the not entirely optimistic statement that the Commission's original procedures (notice with written and oral comment) "might suffice" if they were "administered in a more sensitive, deliberate manner." *Id.* The obsession of the United States Court of Appeals for the District of Columbia Circuit with "innovative" devices, or *ad hoc* procedures, has been criticized by many authorities. *See, e.g.,* DAVIS, ADMINISTRATIVE LAW OF THE SEVENTIES 668 (1976); Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review,* 59 CORNELL L. REV. 375 (1974). If the court of appeals is allowed to continue down this path, it will erode, if not destroy, the utility of rulemaking as a regulatory tool.

The asserted basis for the procedural approach taken by the court of appeals in the decision below is a line of decisions in that circuit, *e.g., International Harvester Co. v. Ruckelshaus,* 478 F.2d 615 (D.C. Cir. 1973), and one decision of the Fourth Circuit, all of which

[42] The opinion below reads: "Many procedural devices for creating a genuine dialogue on these issues were available to the agency —including informal conferences between intervenors and staff, document discovery, interrogatories, technical advisory committees composed of outside experts with differing perspectives, limited cross-examination, funding independent research by intervenors, detailed annotation of technical reports, surveys of existing literature, memoranda explaining methodology." Pet. App. 67.

require or approve "hybrid" rulemaking in the context of the statutes there in question. Pet. App. 43 n.23. This Court need not, however, consider whether the Commission sought to follow such procedures on paper but failed to administer them properly. Pet. App. 67-68 and n.59. Those so-called *International Harvester* procedures were developed in the context of particular statutes (which do not apply here) that required specific findings to be made in reaching individual decisions where, in some instances at least, there would be an individualized economic effect.[43] Thus, even if "hybrid" procedures were appropriate in those decisions on the basis of the particular statutes and perhaps on the basis of considerations of due process, such bases do not exist in this case. *See United States v. Florida East Coast Railway,* 410 U.S. at 244-46. Here, by contrast, the Commission's purpose was to develop, under its flexible rulemaking authority, a description of some of the indirect or secondary impacts to be included in the *Calvert Cliffs'* cost-benefit analysis[44] for individual reactors.

[43] For example, the *International Harvester* decision relied on the four statutory considerations required for the Administrator's decision on an individual application for suspension. *International Harvester,* 478 F.2d 615, 623-24 (D.C. Cir. 1973). Two of these factors related directly to the acts of the applicant; they are not generalized factors. 42 U.S.C. § 1857f-1(b)(5)(D)(ii) and (iii) (1970). *See also,* Citizens To Preserve Overton Park, Inc. v. Volpe, 401 U.S. 402, 411 (1971) where the Court relied on two strict, but non-technological, statutory findings ("formal findings," 401 U.S. at 417) required of the Secretary. *See* Pet. App. 49 n.35 and associated text. These "limits of discretion" were not procedural, but rather substantive statutory requirements, which may make certain more rigorous procedures appropriate. They are distinct from the broad statutory findings required of, and accompanying procedural discretion vested in, the Commission in rulemaking. Siegel v. AEC, 400 F.2d 778, 785 (D.C. Cir. 1968).

[44] This concept of a cost-benefit analysis originated not in NEPA

Moreover, the procedures suggested by the court of appeals are wholly inappropriate to estimate the environmental impacts of a facility for the long-term storage of high-level wastes. Such a facility has never been constructed in this country. At the time of the rulemaking, the conceptual design stage had just been reached, as the decision below recognizes. Pet. App. 52-53. Thus, there were no engineering details concerning the precise environmental impacts of building and operating such a plant.[45] The court of appeals did not discuss reprocessing and waste management. In fact, the opinion below appears to find that the Original Environmental Survey was sufficient in itself to support "the staff's conclusions" without resort to the written comments, the oral proceedings, or the changes reflected in the Final Environmental Survey. Pet. App. 51.

Finally, the decision below indicates that the determination of normalized environmental impacts requires resort to special, but perhaps unknown, procedures due to the "innovative task of implementing NEPA through rulemaking." Pet. App. 67. To the contrary, NEPA requires no special procedures but rather may be fulfilled through the normal procedures utilized by the agency in carrying out its substantive responsibilities. *Union of Concerned Scientists,* 499 F.2d at 1078-79. Nor is there anything unusual about an agency, especially one with "broad responsibility . . . free of close prescription" such as the Commission, relying on expert judgment in finding such normalized facts

but in the language of the *Calvert Cliffs'* opinion. Calvert Cliffs' Coordinating Comm. v. AEC, 449 F.2d at 1113. The *Calvert Cliffs'* interpretation of NEPA requirements is in doubt. *Cf., e.g., SCRAP II,* 422 U.S. at 321 n. 20.

[45] This is not the same as an absence of facts on the storage of wastes. See note 29, *supra.*

as the indirect impacts involved here,[46] rather than insisting upon cross-examination before doing so.[47]

[46] Siegel v. AEC, 400 F.2d 778, 783 (D.C. Cir. 1968). This view of the special latitude afforded the Commission has been repeatedly cited by the courts of appeals. *See, e.g.,* BPI v. AEC, 502 F.2d 424, 428 n.3 (D.C. Cir. 1974).

[47] Assuming arguendo that the court of appeals was correct in finding the rulemaking procedures lacking and the amount of information inadequate, the majority below erred in applying Camp v. Pitts, 411 U.S. 138, 143 (1943). In that case the "vacating" of the "rule" did not change the *status quo:* The Comptroller of the Currency had denied Pitts the bank charter which he sought; the remand did not give Pitts that charter, but, at most, required that the matter be looked at again by the Comptroller "for further consideration."

The opinion below also relies on FPC v. Transcontinental Gas Pipe Line, 423 U.S. 326 (1976). In that case, the *status quo* was preserved effectively by the establishment of an escrow for the amount of money in dispute. *Id.* at 328, n.1.

That is precisely what Judge Tamm argued the court of appeals should have done here. To remand the rule without vacating it is not always an appropriate remedy, but it is in this case.

CONCLUSION

For the reasons stated above, the judgment of the court of appeals should be reversed and the matter remanded to the court of appeals for entry of judgment denying the petitions for review.

Respectfully submitted,

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No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.,
Respondents.

No. 76-528

CONSUMERS POWER COMPANY,
Petitioner,

v.

NELSON AESCHLIMAN, et al.,
Respondents.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF FOR 24 NAMED STATES AS AMICI CURIAE IN SUPPORT OF RESPONDENTS

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1976

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,

against

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.,
Respondents.

No. 76-528

CONSUMERS POWER COMPANY,
Petitioner,

against

NELSON AESCHLIMAN, et al.,
Respondents.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

BRIEF FOR 24 NAMED STATES AS AMICI CURIAE IN SUPPORT OF RESPONDENTS

Statement of Interest of Amici Curiae

The States earnestly support the thorough and effective implementation of the National Environmental Policy Act ("NEPA"), particularly in the course of licensing the con-

struction and operation of nuclear power reactors. NEPA is the only Act of Congress which compels federal agencies to consider the broad range of impacts on health, safety and the environment which may be suffered by the States as a result of federal licensing of nuclear facilities. Though NEPA has been in effect for only eight years, Amici believe the benefits derived from the Act have far outweighed the costs which have been attributed to it so often by federally regulated industries.

The States, which traditionally have borne a responsibility to protect the health and safety of their citizens, have on numerous occasions invoked the protection of the substantive and procedural mandates of NEPA and, as a result, averted serious environmental degradation or the gross waste of fiscal and natural resources. Many of Amici have appeared as intervenors on behalf of their citizens before Atomic Safety and Licensing Boards of the Nuclear Regulatory Commission ("NRC") and have participated in rulemaking proceedings conducted by that agency. The reviews and information gathering conducted pursuant to NEPA have, in the view of Amici, only served to better protect our environment and to bring about more rational decisionmaking on the need for, proper design, and true costs of proposed nuclear facilities.

Arguments that NEPA is the principal culprit causing regulatory delays in the nuclear licensing process are somewhat suspect; at best such arguments, if sincere, are misdirected. Many organizations and individuals are upset with what they view as inordinate regulatory delay, but it is wrong to urge the judicial dismantling of NEPA to achieve their goals and thereby frustrate the Congressional intent in the Act.

As noted in petitioner Vermont Yankee's own brief (pp. 11-12), NRC staff examination of utility applications and safety assessments by the Advisory Committee on Re-

actor Safeguards consume large amounts of time. The public hearings on construction permit applications, which would have to be held even if NEPA had never been enacted, take up relatively little time when compared to these safety reviews and actual construction periods.[1] In fact, industry's study of the problem has revealed that 49 percent of delay months are due to non-licensing causes.[2] Indeed, it has been conceded that while it takes staff only 10 months on the average to conduct the requisite environmental review for a facility, it takes approximately 19 months to complete safety reviews.[3] In the past, Commission personnel have argued for the need to modify certain reactor licensing procedures, but not the NEPA review process.[4] The amount of time attributable to NEPA review is *de mimimis*.

Amici submit that even if NEPA were in part responsible for the purported delay, such delay, when viewed in the context of the magnitude of the decisions to be made, is minor in nature. The type of facilities under discussion in these cases do on occasion take as many as 4 years and even longer to license (Petitioner's Brief ["Pet. Br."], No. 76-419, at 14); they also require, however, 6 years to construct. Of crucial importance though is the fact that each

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[1] NRC officials have testified before Congress that significant delays have not been caused by public involvement in licensing hearings. Hearings Before the Joint Committee on Atomic Energy on Nuclear Power Plant Siting and Licensing, 94th Cong., 1st Sess. (June 25, 1975) at 12-16, 78-79 (Lee Gossick, USNRC).

[2] The Causes of Nuclear Power Plant Delays: An Atomic Industrial Forum Survey 3 (April, 1974).

[3] Grainey, *Nuclear Reactor Regulation: Practice and Procedure Before the Nuclear Regulatory Commission*, 11 Gonzaga L.R. 809, 817 (1976).

[4] Shapar & Malsch, *Proposed Changes in a Nuclear Power Plant Licensing Process: The Choice of Putting a Finger In The Dike or Building a New Dike*, 15 William & Mary L.R. 539, 552-553 (1974).

facility will represent the capital investment of roughly one billion dollars,[5] will operate for approximately 40 years and will generate waste products which must be isolated from man and managed for as long as 250,000 years. To take four years to make a decision involving such an enormous commitment is completely justifiable.

The States do not believe NEPA or the decisions below threaten technological progress in this country or will undermine our Nation's efforts to simultaneously conserve and produce energy. The Act and the decisions only pose a threat to hasty or otherwise irrational decisions based on incomplete assessments of all the true costs of and alternatives to proposed licensing actions.

The continued integrity of NEPA is vital to the States and the Nation.

Statement of the Case

We subscribe to the statement of facts set forth in the brief for respondents Natural Resources Defense Council, Inc., *et al.* in No. 76-419, but wish to emphasize several points.

The operation of any nuclear power reactor entails a number of activities which have the potential for adversely affecting the public's health and safety and the environment. One aspect of operation is that reactors, as do many other industrial facilities, discharge waste products. Reactors do so in the form of spent fuel. Upon removal from the reactor core, spent fuel must be contained so as to shield persons and the environment from the highly

[5] Costs approaching $1 Billion are projected for new 1100MWe facilities. General Accounting Office, *Cleaning Up the Remains of Nuclear Facilities—A Multibillion Dollar Problem*, June 16, 1977 (EMD-77-46) at 17. See also Ford Foundation, Report of the Nuclear Energy Policy Study Group, Nuclear Power Issues and Choices, Ballinger Pub. Co. (1977) (hereinafter "Nuclear Power Issues") at 115-118.

penetrating radiation emitted by certain fission products. The fuel is typically stored in special pools of water which keep the temperature of the rods to safe levels and act as the necessary shield against radiation. It had been assumed by the then United States Atomic Energy Commission (AEC)[6] when it issued the rulemaking order reviewed by the Court of Appeals below,[7] that spent fuel would ultimately be subjected to a chemical extraction process, known as fuel reprocessing, to separate the unfissioned uranium and plutonium generated within the reactor core from other fission products, referred to as the "high level wastes." These wastes, which must be stored for many hundreds of years before levels of radioactivity fall off to safe levels, were to be surrendered to the AEC for long term management.[8] To date, no facilities or sites for the long term management of these wastes have been officially designated by either the AEC or its successor, the NRC.

Petitioner places great emphasis on the fact that most of the existing high level wastes in this country were produced as a result of the federal government's weapons program (Pet. Br., 10), but misleads the Court by failing to tell all of the facts regarding spent fuel and commercial high level liquid wastes.

> "While the volume of military wastes is large, the concentration of radioactive material in it is small compared with that in commercial waste *even if the latter is reprocessed.* This has frequently led to misleading comparisons between the amounts of military

[6] Now the United States Nuclear Regulatory Commission (NRC). The AEC was abolished by the Energy Reorganization Act of 1974, 42 U.S.C. § 5801 *et seq.* and its regulatory functions were assumed by the NRC.

[7] Environmental Effects of the Uranium Fuel Cycle, 39 Fed. Reg. 14188 (April 22, 1974). App. 385-400.

[8] 10 CFR Part 50, App. F, subsec. 2 (1977).

and commercial wastes. The amount of radioactivity in present commercial spent fuel waste is comparable to that in military waste and is increasing much more rapidly." Nuclear Power Issues, *supra* note 5, at 244, n.b. (Emphasis supplied).

In addition, the fiscal costs of waste management are significant. One commercial reprocessing facility operated in the United States for approximately 5½ years, closing in 1972. That plant, owned by Nuclear Fuel Services, Inc. (NFS), was located in West Valley, New York, outside of the city of Buffalo. It operated at extremely low capacity, but was nevertheless studded with controversy concerning excessive employee exposure to radiation and abnormal releases of radioactive effluents.[9] NFS generated 600,000 gallons of high level wastes which are still stored in "temporary" tanks on site. Last spring the company announced that it was abandoning the reprocessing field and would attempt to surrender the plant and all wastes to State government.

It has been projected in studies prepared for the NRC that the cost of decontaminating and decommissioning the Nuclear Fuel Services complex and disposing of the existing high level wastes may be in excess of $600,000,000. Monte Canfield, Director of the Energy and Minerals Division of the General Accounting Office, testified before Congress on waste disposal costs in part as follows:

> ". . . an ERDA contractor estimates that the cost of waste disposal at NFS would range from $58 million to $567 million. The contractor's study did not cover the

[9] Hearings on Nuclear Waste Disposal Costs (West Valley, New York) Before the Subcommittee on the Environment, Energy and Natural Resources of the House Committee on Government Operations (March 8 and 10, 1977) (hereinafter "Hearings on Nuclear Waste Disposal Costs") at 5.

> cost of decommissioning the plant. However, the contractor estimated that it would cost from $10.7 million to $65.7 million to decommission the Barnwell reprocessing plant, a plant which would be used to process spent commercial fuel." Hearings on Nuclear Waste Disposal Costs, *supra* note 9, at 12.[10]

Mr. Canfield went on to note that these figures could prove to be gross underestimates of actual costs. *Id.* Thus, while the volume of waste generated by commercial fuel reprocessing has been small to date when compared to the volume of waste from the federal nuclear weapons program, the fiscal costs are indeed substantial.

The Court of Appeals has recognized below[11] that NEPA requires the NRC to consider the costs and impacts of managing a nuclear reactor's wastes prior to an irreversible commitment of resources to the construction of the reactor and the generation of high level wastes. The wisdom of this decision is underscored by recent Congressional observations. In speaking of the problem of disposing of existing commercial high level liquid wastes, Subcommittee Chairman Leo J. Ryan stated,

> "Since the United States entered the so-called atomic age in the mid-1950's, the champions of nuclear power appear to have addressed their efforts primarily to the development of nuclear fuels and the production of power. But the management of the radioactive wastes generated seems to have been dismissed with an attitude of: 'We can solve that problem later; let's get on with the important work: namely getting the power plants on line.' But 'later,' as far as we

[10] These estimates were set forth in "Alternative Process for Managing Existing Commercial High Level Radioactive Wastes" NUREG-0043 (April 1976).

[11] In the decision being reviewed in *Vermont Yankee Nuclear Power Corporation* v. *Natural Resources Defense Council, Inc.*, No. 76-419.

are concerned in this subcommittee, is today." Remarks of the Subcommittee Chairman, Hearings on Nuclear Waste Disposal Costs, *supra* note 9, at 1.

Amici will demonstrate below that NEPA requires a consideration of the costs and impacts of fuel reprocessing and waste from any reactor prior to licensing by the federal government. To ignore these wastes and to license a facility without their inclusion in the cost-benefit analysis of the facility distorts that analysis and invalidates the final judgment as to whether licensing an individual facility is the appropriate choice among alternative federal actions.[12] Amici believe the impacts of a reactor's waste cannot be considered later, but must be considered prior to licensing. The fragmented approach to environmental review urged by petitioner is proscribed by NEPA.[13]

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[12] It is significant that the conservation alternative urged by respondents in *Consumers Power Company* v. *Nelson Aeschliman*, No. 76-528, is now a major component of the National Energy Plan:

"The sixth principle, and *the cornerstone* of National Energy Policy, is that the growth of energy demand must be restrained through conservation and improved energy efficiency." *The National Energy Plan*, Executive Office of the President, Energy Policy and Planning, p. 28 (1977). (Emphasis supplied).

The States submit that energy conservation is an alternative to licensing which must be actively considered by responsible federal officials prior to final decisions on proposed energy related actions.

[13] As noted, the Table S-3 Rule was developed with a view to the eventual reprocessing of nuclear fuel, however, National policy has developed in another direction. On April 7, 1977 President Carter announced that the United States would "defer indefinitely the commercial reprocessing and recycling of the plutonium produced in the U.S. nuclear power programs." 13 Weekly Comp. of Pres. Doc. 503 (April 11, 1977) and 581 (April 25, 1977). This policy was foreshadowed on October 28, 1976 by the publicly-announced conclusion of President Ford that reprocessing

(footnote continued on following page)

The Court of Appeals decision on the Table S-3 Rule is well founded. Contrary to the characterizations of the federal respondents and petitioner, the Court did not reject the Table S-3 Rule devised by the Commission on the basis of the rulemaking procedures utilized, but rather because of the glaring inadequacy of the record. Though the day and one-half hearing on the impacts of the entire nuclear fuel cycle would have been suspect to any objective onlooker, it was not the brevity of the proceedings which compelled the Court below to reverse the AEC. It was the AEC's complete acceptance of the unreferenced, naked assertions by its own staff witness in charge of the agency's nuclear waste program which rendered the rule fatally defective.

(footnote continued from preceding page)

could no longer be regarded as a necessary step in the nuclear fuel cycle. 12 Weekly Comp. of Pres. Doc. 1625 (November 1, 1976). On May 3, 1977 the NRC announced that it would reassess its position on fuel reprocessing in response to the Administration's policy. 42 Fed. Reg. 22964 (May 5, 1977). The period for public comment on the NRC announcement closed on June 3, 1977 and a Commission decision in forthcoming. Hence, whether or not the substance of the Table S-3 Rule will be germane to future reactor licensing is problematical. Indeed, the question placed before the court as to whether the overall totals in Table S-3 are supported by the administrative record on the issues of fuel reprocessing and high level waste management may be rendered unworthy of review by the pending NRC policy reassessment.

ARGUMENT

I.

The Court of Appeals' holding that the Commission failed to explain adequately on the record its decision that the environmental effects of nuclear waste disposal are "relatively insignificant" is required by both the Administrative Procedure Act and the National Environmental Policy Act.

In its brief, petitioner Vermont Yankee seeks to characterize the holding of the Court of Appeals as based on the premise that the Commission employed inadequate procedures in reaching its conclusion that environmental effects of the nuclear fuel cycle, including waste disposal, are "relatively insignificant" (Pet. Br., 30-31). The federal respondents, in their brief, regard it as "open to dispute" as to whether the Court of Appeals' decision should be read as petitioners read it, or should be read as holding that the Commission's decision was not based on an adequate record (Federal Respondents' Brief ["Federal Br."] at 36-38). The federal respondents concede that if the Court of Appeals' ruling is read in the latter fashion, "no significant question for review by this Court would be presented." *Id.*

The States can only view with skepticism the uncertainty of the federal respondents as to whether the Court of Appeals' decision was based on the inadequacy of the Table S-3 record or rulemaking procedures. In subsequent notices regarding the new hearings on the rule in which the Commission has refused to increase significantly the scope of procedures and public participation in the hearings, the Commission has consistently taken the position that the Court of Appeals did not find the Commission's prior procedures to be inadequate, but rather merely determined the record to be incomplete (41 Fed. Reg. 45849, 45850 [October 18, 1976]):

> "[T]he court found that the rule was inadequately supported by the record insofar as it treated two particular aspects of the fuel cycle—the impacts from reprocessing of spent fuel and the impacts from radioactive waste management."

In a more recent notice the Commission stated that:

> "The original procedures proved adequate for development and illumination of a wide range of fuel cycle impact issues . . . . True, the record was held inadequate on the two matters at issue here, but these issues are of the same character as the other issues regarding which the record did prove adequate. . . .
>
> ". . . The court here indicated that the procedures previously employed could suffice, and indeed did for other issues . . . .
>
> • • •
>
> "Accordingly, notice is hereby given that the rules for the conduct of the reopened hearing and the authorities and responsibilities of the Hearing Board will be the same as originally applied in this matter (38 FR 49, January 3, 1973) except that specific provision is hereby made for the Hearing Board to entertain suggestions from participants as to questions which the Board should ask of witnesses for other participants." 42 Fed. Reg. 26987, at 26988-89 (May 26, 1977).[14]

Nevertheless the federal respondents have gone on to urge that if the Court is to be taken as having required additional procedures, it exceeded the authority given it by Congress to review informal rulemaking proceedings (*Id.*, at 46-51). Petitioner Vermont Yankee takes the identical position (Pet. Br., 35-38).

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[14] Reprinted in Supplemental Appendix to the Petition for Certiorari in No. 76-419 at SA-20 to SA-24.

Amici curiae have no quarrel in general terms with this view of the scope of judicial review of informal rulemaking. Indeed, *amici* agree that, except where strong justification is shown, a court ought not to be able to require additional procedures in such proceedings, since the result of the existence of such a power would be to cause agencies to adopt more and more elaborate procedures and thus defeat the purpose of informal rulemaking. But *amici* do not feel that the Court of Appeals violated this rule in this case; the Court did not invalidate the Commission's rule because of some failure to employ certain particular procedures. The rule was invalidated because the Commission completely failed to explain the reasoning it employed in reaching its conclusion, and thus presented the Court of Appeals with an inadequate record.

A. The Administrative Procedure Act Requires That Agencies Engage in Reasoned Decisionmaking in Informal Rulemaking.

Under § 706(2)(A) of the Administrative Procedure Act, 5 U.S.C. § 706(2)(A), a Court is empowered to "hold unlawful and set aside agency action, findings and conclusions found to be . . . arbitrary, capricious, an abuse of discretion . . ."[18] This Court has interpreted this standard to mean that, in reviewing agency action, "the court must consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error in judgment," which may "require some explanation in order to determine if the . . . [agency's] action was justifiable." *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402, 416, 420. "The agency must articu-

[18] This standard applies regardless of whether the agency is engaged in its adjudicatory capacity, or in its formal or informal rulemaking capacity, "agency action" being defined by the APA to include any agency "rule, order, license, sanction, relief or the equivalent or denial thereof, or failure to act." 5 U.S.C. § 551(13).

late a 'rational connection between the facts found and the choice made.'" *Bowman Transportation, Inc.* v. *Arkansas-Best Freight System*, 419 U.S. 281, 285, citing *Burlington Truck Lines* v. *United States*, 371 U.S. 156, 168. See also *Camp* v. *Pitts*, 411 U.S. 138, 142.

While none of these statements were made in the context of review of informal rulemaking, the principles expounded therein have been applied by numerous Courts of Appeals in reviewing such administrative action. "Courts require that administrative agencies 'articulate the criteria' employed in reaching their result and are no longer content with bare administrative *ipse dixits* based on supposed administrative expertise." *Appalachian Power Co.* v. *Train*, 545 F. 2d 1351 (4th Cir. 1976), quoting from *Appalachian Power Co.* v. *Environmental Protection Agency*, 477 F. 2d 495, 507 (4th Cir. 1973). "The grounds upon which an agency bases its decision must be clearly disclosed in, and sustained by, the record. The agency must make plain its course of inquiry, its analysis and its reasoning." *American Petroleum Institute* v. *Environmental Protection Agency*, 540 F. 2d 1023, 1029 (10th Cir. 1976). In the absence of a detailed record, it is "advisable for the agency, in lieu thereof, to provide a thorough and comprehensible statement of the reasons for its decision." *National Nutritional Foods Ass'n* v. *Weinberger*, 512 F. 2d 688, 701 (2d Cir. 1975). See generally, *Ethyl Corporation* v. *Environmental Protection Agency*, 541 F. 2d 1, 33-37 (D.C. Cir. 1976); *American Meat Institute* v. *Environmental Protection Agency*, 526 F. 2d 442, 453 (7th Cir. 1975). General principles of administrative law have long imposed an affirmative duty upon administrative agencies to compile a complete record. See *Scenic Hudson Preservation Conference* v. *Federal Power Commission*, 354 F. 2d 608, 620-621 (2d Cir. 1965), cert. den. 384 U.S. 941, and the cases cited therein.

B. The National Environmental Policy Act Requires That, in Undertaking Informal Rulemaking, Agencies Engage in Reasoned Consideration of Environmental Consequences.

Section 102(2)(c) of the National Environmental Policy Act requires that before undertaking any "major Federal action," an agency of the federal government shall prepare a statement describing in detail the environmental consequences of the action. 42 U.S.C. § 4332(2)(C). In *Kleppe* v. *Sierra Club*, 427 U.S. 390, this Court observed that in reviewing the adequacy of such statements the "role for a court is to insure that the agency has taken a 'hard look' at the environmental consequences." *Id.* at 410, n. 21, citing *Natural Resources Defense Council* v. *Morton*, 458 F. 2d 827, 838 (D.C. Cir. 1972) (LEVENTHAL, J.); *New York* v. *Kleppe*, 429 U.S. 1307, 1310-11 (circuit opinion of MARSHALL, J.). In other words, the court's obligation is to "scrutinize the analysis of environmental consideration, [to assure] that a reasoned decision has been reached." *Portland Cement Association* v. *Ruckelshaus*, 486 F. 2d 375, 386 (D.C. Cir. 1973) (LEVENTHAL, J.).

In order to facilitate such review, the obligation of the agency in preparing its statement is to "explicate fully its course of inquiry, its analysis and its reasoning." *Ely* v. *Velde*, 451 F. 2d 1130, 1139 (4th Cir. 1971). The statement cannot be "too vague, too general and too conclusory," *Environmental Defense Fund* v. *Froehlke*, 473 F. 2d 346, 348 (8th Cir. 1972), and cannot be "unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind." *Natural Resources Defense Council* v. *Grant*, 355 F. Supp. 280, 287 (E.D.N.C. 1973). Moreover, scientific conclusions appearing in an impact statement without reference to the relevant literature or the field studies from which the conclusions were drawn do not constitute an adequate "detailed statement." *Environmental Defense Fund* v. *Tennessee Valley Authority*, 339 F. Supp. 806, 809 (E.D. Tenn., 1972). When comments from outside the agency "disclose new or conflicting data or opinions that cause concern that the agency may not have fully evaluated the project and its alternatives, these comments may not simply be ignored. There must be good faith, reasoned analysis in response." *Silva* v. *Lynn*, 482 F. 2d 1282, 1285 (1st Cir. 1973). See also *City of Rochester* v. *United States Postal Service*, 541 F. 2d 967, 973 (2d Cir. 1976); *Appalachian Power Co.* v. *Environmental Protection Agency, supra*, 477 F. 2d 507; *Sierra Club* v. *Morton*, 510 F. 2d 813, 820 (5th Cir. 1975); *Minnesota Public Interest Research Group* v. *Butz*, 541 F. 2d 1292, 1299-1300 (8th Cir. 1976).

It is true that in the present case, the Commission's rulemaking proceeding itself is not a "major Federal action" within the meaning of Section 102(2)(C) of NEPA (App. 66, n. 58). However, there are two independent reasons which justify the Court of Appeals' application of the "hard look" test of *Kleppe* v. *Sierra Club, supra*, 427 U.S. 410, n. 21, in its review of the Commission's rule-making.

First, the mandate of NEPA—that Federal agencies give "substantial and consistent consideration to environmental factors in their decisionmaking"—is not limited to "major Federal actions"; only the procedural requirement to prepare an EIS is. *Rhode Island Committee on Energy* v. *General Services Administration*, 397 F. Supp. 41, 58 (D.R.I., 1975); *cf. Environmental Defense Fund* v. *Corp. of Engineers*, 470 F. 8d 289, 298 (8th Cir. 1972), cert. den., 412 U.S. 931. Section 102(1) of NEPA, 42 U.S.C. § 4332(1), is a specific directive to the agency that it give full, good faith consideration to the relevant environmental issues implicated in any of its actions, including rulemaking. *Calvert Cliffs Coordinating Committee* v. *United States Atomic Energy Commission*, 449 F. 2d 1109, 1112-13, n. 5 (D.C. Cir. 1971).

Secondly, and more importantly, the obligation of the reviewing court under NEPA to insure that the agency in

this case has taken a "good, hard look" at the problem of waste disposal prior to issuing a permit can only be fulfilled in its review of the Commission's rulemaking proceeding. By providing that "[n]o further discussion of the environmental effects [of nuclear waste produced by the applicant's facility] shall be required [in an EIS]" other than the reprinting of Table S-3 (App. 398), the rule in effect declares that the Commission has, as a matter of law, satisfied the requirement of 42 U.S.C. § 4332(2)(C) for every subsequent proceeding involving the issuance of a permit for a nuclear power facility. Restated in its simplest terms, the rule says that the Commission has already taken the "good, hard look" at the problem of nuclear waste control as required by NEPA. Because the rule forecloses any further inquiry as to the sufficiency of Table S-3 for NEPA purposes in all subsequent licensing proceedings, the only opportunity for determining whether the Commission has accomplished what its rule says it has accomplished—the NEPA-mandated "good, hard look" at nuclear waste control—is in the Court of Appeals' review of the rule itself.

C. The Court of Appeals Held that the Commission's Action was Unlawful Because the Commission Failed to Provide a Reasoned Explanation on the Record of its Conclusion.

Analysis of the Court of Appeals' opinion shows that its basis for overturning the Commission's action was not that the Commission failed to employ certain procedures, but that it failed to explain its reasoning on the record as required by both the APA and NEPA. At the outset, the Court stated the question as follows:

> "The problems posed in both these cases relate to the manner and extent to which information concerning the environmental effects of radioactive wastes must be considered *on the public record* in decisions to license nuclear reactors." (App. 30) (Emphasis supplied).

After reviewing the history of the proceedings before the Commission, and stating the contentions of the parties as to their adequacy, the Court carefully outlined the narrow scope of review under which it was operating. Citing the mandate of this Court in *Federal Power Commission* v. *Transcontinental Gas Pipe Line Corp.*, 423 U.S. 326, that it is "not proper" for a court to prescribe specific procedures for an agency in informal rulemaking the Court stated its duty to be only to

> ". . . scrutinize the record as a whole to insure that genuine opportunities to participate in a meaningful way were provided, and that the agency has taken a good, hard look at the major questions before it." (App. 46)

The Court finally concluded that in determining whether such a "hard look" has been taken, it is far less concerned with the devices by which the agency proceeded than with the rigor with which it explained its results.

> ". . . [W]hat is required is a reasoned response, in which the agency points to particulars in the record which, when coupled with its reservoir of expertise, support its resolution of the controversy. An agency may abuse its discretion by proceeding to a decision *which the record before it will not sustain,* in the sense that it raises fundamental questions for which the agency has adduced no *reasoned answers.*" (App. 50) (Emphasis supplied).

With these principles in mind, the Court then undertook an exhaustive examination of the record before it in this case, probing for any discussion of the reasoning or judgments on which the Commission based its decision on the problem of nuclear waste disposal (App. 50-65). It found the record completely devoid of such explanations. It noted that the Enviromnental Survey prepared by the Commission staff and later incorporated into its

rule failed to provide a "detailed explanation" of its conclusion that the problem was insignificant, relying entirely on the mere statement of a Commission officer that a "permanent repository" will be established and maintained by the federal government (App. 53). The Court observed that this statement represented a radical shift in Commission policy away from an earlier plan to store the wastes in abandoned salt mines, but found that the reasons for such a shift were "not discussed" (App. 54). As for the repository plan itself, the Court found the description of it in the survey utterly "conclusory." It found no discussion as to its method of construction and operation, or of its cost or location; no explanation as to why a "meltdown" would not occur, or what would be done if it did; no plan for protecting the facility from terrorists (App. 53-63). The Court then observed:

> "We do not dispute [the Commission's] conclusions. We may not uphold them, however, lacking a thorough explanation and a meaningful opportunity to challenge the judgments underlying them. Our duty is to insure that the reasoning on which such judgments depend, and the data supporting them, are spread out in detail on the public record." (App. 61).

It then concluded:

> "In substantial part, the materials uncritically relied on by the Commission in promulgating this rule consist of extremely vague assurances by agency personnel that problems as yet unsolved will be solved. That is an insufficient record to sustain [the rule]. . . . Without a thorough exploration of the problems involved in waste disposal, . . . this type of agency action cannot pass muster as reasoned decision-making." (App. 65-66).

The Commission's action, therefore, violated the requirements of Section 102(2)(C) of the National Environmental Policy Act, 42 U.S.C. § 4332(2)(C), that the Commission

"articulate its reasoning and . . . specify the evidence on which it relies," as well as the requirement of Section 706(2)(A) of the Administrative Procedure Act that an agency action not be "capricious and arbitrary." (App. 69, 71).

In the face of all this, petitioner Vermont Yankee and federal respondents incredibly suggest that the holding of the Court of Appeals has something to do with requiring that the Commission adopt additional procedures before it may validly promulgate the rule at issue. In fact, of course, the opposite is true. The Court was quite explicit that it was not particularly concerned about *how* the Commission went about "fleshing out" the record. Even the procedures actually adopted "if administered in a more sensitive, deliberate manner, might suffice" (App. 67). Significantly, petitioner and federal respondents provide no relevant citation to the Court's actual words; their briefs are more interested in talking about how the Court has no power to require specific procedures in informal rulemaking proceedings.[16] *Amici* do not dispute this point; in fact, as indicated above, they agree with it. The point is that the Court of Appeals imposed no additional requirements, invaded no discretion, but merely returned to an agency a decision so utterly conclusory as to be incapable of review.

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[16] At page 48 the federal respondents' brief states that Court "set aside the agency rule because it found the procedural format insufficient." There is no citation to court's opinion; nor could there be, since the court did not hold this at all.

II.

NEPA requires that the licensing of nuclear power generating plants proceed only upon a record which contains thorough consideration of the environmental impacts of nuclear waste disposal.

The pertinent provisions of the National Environmental Policy Act direct all agencies of the federal government, in connection with all "major Federal actions significantly affecting the quality of the human environment," to prepare a "detailed statement" on

> "(i) the environmental impact of the proposed action,
>
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented.
>
> • • •
>
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." (42 U.S.C. § 4332 [2][C]).

It is undisputed that the licensing of a nuclear power plant is a "major Federal action" within the meaning of NEPA (App. 33-34). It is also undisputed that the licensing and consequent operation of nuclear power generating plants, as an absolute certainty, and without the intervention of any other event, produces long-lived and highly toxic radioactive wastes. *Id.*

From the outset of the proceedings before the Atomic Safety and Licensing Board to license the operation of the Vermont Yankee nuclear plant, the intervenors, Natural Resources Defense Council, Inc., et al., attempted to have that Board consider, within its NEPA mandate, the environmental impact of reprocessing and nuclear waste disposal. Their attempts were unavailing, as both the Licensing and Appeal Boards ruled that evidence on the environmental impact of radioactive waste disposal could not be admitted in the proceedings to license Vermont Yankee (App. 112, 113, 129). The ruling of the Appeals Board was based fundamentally on its perception that the Commission's responsibilities under NEPA with respect to waste disposal issues could be fulfilled at some future point when proposals to license reprocessing and waste facilities came before it to be licensed (App. 123-124). Further, the Appeals Board stated in June of 1972:

> "Evaluation of the environmental aspects of the ultimate depository of the high level wastes resulting from reprocessing is at this time speculative, because it has not yet been determined what the nature or the location of the ultimate depository may be. That project will also of course be subject to independent analysis and procedures in compliance with the Environmental Protection Act, (sic) and it cannot be the subject of appropriate evaluation in this proceeding." (App. 126-127).

Six months after the Appeal Board's ruling that the environmental impacts of radioactive waste disposal were too remote and speculative in the context of reactor licensing proceedings to be susceptible of meaningful analysis under NEPA, the Commission announced the commencement of a rulemaking proceeding to do precisely that which it had maintained in the *Vermont Yankee* proceedings was impossible (App. 352-360). It also announced that the Staff of the Commission had already prepared an "Environmental Survey of the Nuclear Fuel Cycle" which included Table S-3, designed to quantify the annual contribution of each reactor to the total fuel-cycle environmental costs, including reprocessing and waste disposal impacts (App. 356-360).

These rulemaking proceedings will be discussed at somewhat greater length below. It is sufficient to note at this point that the rulemaking, which was conducted without adjudicatory procedures, dealt in pertinent part with precisely the same issues that the intervenors had attempted to raise in *Vermont Yankee* and culminated in the promulgation of a regulation adopting a slightly modified version of Table S-3, providing that it should be inserted in each environmental impact statement prepared pursuant to NEPA for individual reactor licensing proceedings, and further providing that, in each licensing case "[n]o further discussion of such environmental effects shall be required" (App. 398). The Commission ruled: "Insofar as this rule differs from the Appeal Board decisions in 'Vermont Yankee' supra, those decisions have no further precedential significance." (App. 386).

What the Commission had done then, was to rule first that reprocessing and waste disposal impacts were too speculative to be considered in reactor licensing proceedings and then to reverse itself by promulgating a rule which purported not only to fully consider these impacts, but to resolve them beyond the possibility of argument for *all* licensing proceedings for the indefinite future. The door was closed shut after the promulgation of Table S-3 (App. 398; *see also,* Federal Br., 16, n. 13).

Both Vermont Yankee and the federal respondents profess confusion about the meaning of the decision of the Court of Appeals. The *amici* suggest that the holding is quite clear. The Court held that the generation of nuclear waste is an "adverse environmental effect which cannot be avoided" if a nuclear power plant is licensed, within the meaning of NEPA, 42 U.S.C. § 4332(2)(C)(ii), (App. 33). The generation of such wastes and the facilities and resources necessarily required to protect and contain them constitute an "irreversible and irretrievable commitment of resources" which necessarily will follow upon the licensing

of a nuclear power plant, within the meaning of 42 U.S.C. § 4332(2)(C)(v), (App. 33). The Court found that NEPA requires such impacts to be considered in the licensing of power reactors, and agreed with the Commission that the requisite analysis could be performed in the context of a rulemaking proceeding (App. 39, 67-68). Finally, the Court held that the cursory record on waste disposal issues compiled by the Commission in the rulemaking proceeding for Table S-3 was insufficient to show whether reasoned decisionmaking had in fact taken place, and "frustrate(d) oversight by anyone." (App. 61-62). The Court directed the agency, in the rulemaking forum, to "identify and address information contrary to its own position, to articulate its reasoning and to specify the evidence on which its relies." (App. 69).

Whatever the merits of the rule itself, or of the record compiled before the agency, it is clear that, in promulgating Table S-3, the Nuclear Regulatory Commission recognized that the environmental impact of reprocessing and waste disposal were relevant issues under NEPA to be included in the Environmental Impact Statement for each reactor and considered by the Atomic Safety and Licensing Board in each licensing proceeding. Indeed, the federal respondents do not contest this point, but rest their entire argument on the sufficiency of the procedures used in promulgating Table S-3.

The petitioner Vermont Yankee takes a different view. It stands by the Appeal Board's ruling in the *Vermont Yankee* licensing proceeding to the effect that the "proposal" before the Commission in any individual licensing case is simply to authorize construction or operation of a power reactor and that the environmental impact of the wastes generated by the reactor can be fully considered when reprocessing and waste disposal facilities are licensed (Pet. Br., 40-41). The position is curious given that the Commission expressly rejected this reasoning when it promulgated Table S-3 and invalidated the "precedential

significance" of the Appeal Board's ruling in *Vermont Yankee* (App. 386).

The petitioner relies heavily on *Kleppe* v. *Sierra Club, supra,* 427 U.S. 390, as support for the proposition that the Commission should completely exclude consideration of the environmental impacts of waste disposal from proceedings to license nuclear reactors. This reliance is misplaced. The ruling in *Kleppe* was that, as a factual matter, the federal government was not engaged in or proposing a Northern Great Plains regional coal development program, and that such a region-wide intent could not be inferred from the government's decision to undertake coal development activities in several discreet locales. *Id.* at 400. Therefore, there was no "proposal" for the region and no requirement for a regional Environmental Impact Statement under NEPA. It is worth noting that the Court reaffirmed the proposition in *Kleppe* that NEPA is action-forcing, in that it requires "all agencies to assure consideration of the environmental impact of their actions in decisionmaking." *Id.* at 409.

The situation presented by the cases at bar is entirely different and there is nothing in *Kleppe* inconsistent with the decision below. No party contends that the "proposal" is anything other than a proposal to license a nuclear power generating plant. Amici argue simply that irrefutably inherent in this proposal is the creation of radioactive waste; it is an "adverse environmental effect which cannot be avoided." 42 U.S.C. § 4332(C)(ii). The Court of Appeals was clearly correct in ruling:

> "The plain meaning of this language encompasses radioactive wastes generated by the operations of a nuclear power station, just as it does the stack gases produced by a coal-burning power plant." (App. 33).

If the position of the petitioner were adopted, it would mean that those given the authority and the public trust

to license nuclear power plants could do so while indefinitely deferring the consideration of the most diuturnal environmental impact of their actions in decisionmaking—the creation of long-lived toxic wastes. Meanwhile, those wastes would be created and stored at nuclear plant sites never originally intended as long or medium-term waste repositories. By the time the ramifications of radioactive waste came to be considered, our options as a society would be substantially curtailed. *Scientists' Institute for Public Information, Inc.* v. *A.E.C.,* 481 F. 2d 1079, 1090 (1973).[17] We can imagine no clearer case for application of the principle that, pursuant to NEPA, the federal agency must consider the natural consequences of its decisions before it makes them. *Calvert Cliffs Coordinating Committee* v. *A.E.C., supra* 449 F. 2d 1112; *Kleppe* v. *Sierra Club, supra* 427 U.S. 409.

Petitioners maintain that to construe NEPA so as to require consideration of radioactive waste disposal impacts would involve what amounts to an unwarranted amendment to the Atomic Energy Act. The argument, stripped of its hyperbole, is that Congress has authorized the operation of commercial nuclear reactors through passage of the Atomic Energy Act and could not have intended any application of NEPA which might complicate or alter the licensing process. In short, petitioners are here attempting to reopen issues resolved by the *Calvert Cliffs* case. In answer to the argument, propounded at that time by the Atomic Energy Commission, that its statutory mission to license power plants conflicted with the requirements of NEPA, the Court held:

> "NEPA, first of all, makes environmental protection a part of the mandate of every federal agency and

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[17] *See also, Calvert Cliffs Coordinating Committee* v. *A.E.C., supra* 499 F. 2d 1128: "If 'irreversible and irretrievable commitments of resources' have already been made, the licensing hearing (and any public intervention therein) may become a hollow exercise."

department . . . Perhaps the greatest importance of NEPA is to require the Atomic Energy Commission and other agencies to consider environmental issues just as they consider other matters within their mandates.

• • •

"But the very purpose of NEPA is to tell federal agencies that environmental protection is as much a part of their responsibility as is protection and promotion of the industries they regulate." 449 F. 2d 1112.

In any case, it is not at all clear that Congress is as sanguine about the nuclear power industry, and the Commission's regulation of it, as the petitioner suggests. The Energy Reorganization Act of 1974, 42 U.S.C. 5801 *et seq.*, effected an extremely significant change in the historical pattern of regulation and promotion of the nuclear industry in this country, separating the Atomic Energy Commission into two agencies and vesting the Nuclear Regulatory Commission with regulatory and licensing functions only. 42 U.S.C. §§ 5841-5849. In substantial part, this legislative action was in response to the Congressional perception that promotional and regulatory goals could not appropriately continue to be exercised jointly by the Atomic Energy Commission in a field so sensitive as nuclear power.[18]

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[18] "The reorganization established by this legislation has the additional purpose of separating the regulatory functions of the A.E.C. from its developmental and promotional functions—a response to growing criticism that there is a basic conflict between the AEC's regulation of the nuclear power industry and its development and promotion of new technology for the industry." S. Rep. N. 93.980, U.S. Code & Cong. News, 5470, 5471 (1974). See also *Note: The Energy Reorganization Act of 1974: More Power To The People?* 7 Loy. Chi. L.J. 410 (1976); Davis, *Citizen's Guide To Intervention In Nuclear Power Plant Siting: A Blueprint for Alice In Nuclear Wonderland*, 6 Env. Law 619, 628, n. 36 (1976).

The petitioner's final argument, a derivative of the preceding one, is that full consideration of the environmental impact of radioactive wastes will bring the nuclear power program to a halt. It bears mentioning that this case has not even brought the Vermont Yankee plant to a halt. It is still operating and generating electricity. Two points should be made in response to these dire predictions. First, the Court below specifically approved the use of generic rulemaking proceedings to treat these issues so long as the record generated would truly justify the conclusions made by the agency (App. 68-69). What the Court held is that, absent fair and thorough generic proceedings, the issues cannot be ignored in individual licensing cases (App. 39).

Second, NEPA does not dictate a particular substantive result on these or any other issues. Rather, it mandates a "hard look" at environmental costs, based on the premise that decisionmakers will best exercise their authority when they are fully cognizant of the whole range of consequences of their acts. *Kleppe* v. *Sierra Club, supra,* 427 U.S. 410, n. 21. If the benefits of proceeding with nuclear plants outweigh the costs, including the costs inherent in the creation of radioactive wastes, then nuclear plants will be licensed. If they do not, or if special measures need to be taken to mitigate environmental damage in the future, it is far better that we discover that now rather than after the problem has thrown the Nation into another energy-related "crisis."

CONCLUSION

For the foregoing reasons, the judgment of the Court of Appeals should be affirmed.

Dated: New York, New York, September 8, 1977.

Respectfully submitted,

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IN THE
Supreme Court of the United States
OCTOBER TERM, 1977

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,
Respondents.

No. 76-528

CONSUMERS POWER COMPANY,
Petitioner,

v.

NELSON AESCHLIMAN, SAGINAW VALLEY NUCLEAR STUDY GROUP, *et al.*,
Respondents.

On Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

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BRIEF FOR *AMICUS CURIAE* UNION OF CONCERNED SCIENTISTS FUND, INC. IN NO. 76-419

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1977

No. 76-419

VERMONT YANKEE NUCLEAR POWER CORPORATION,
Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., *et al.*,
Respondents.

No. 76-528

CONSUMERS POWER COMPANY,
Petitioner,

v.

NELSON AESCHLIMAN, SAGINAW VALLEY NUCLEAR STUDY GROUP, *et al.*,
Respondents.

On Writ of Certiorari to the United States Court of Appeals for the District of Columbia Circuit

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BRIEF FOR *AMICUS CURIAE* UNION OF CONCERNED SCIENTISTS FUND, INC. IN NO. 76-419

INTERESTS OF *AMICUS CURIAE*

The Union of Concerned Scientists Fund, Inc. ("UCS")[1] files this brief *amicus curiae* in No. 76-419

[1] The organization is commonly know as the "Union of Concerned Scientists". It participated in the uranium fuel cycle rulemaking hearing (*App.* 352-400, 538-1339) under that name.

by consent of all parties. Copies of the letters of consent have been filed with the Clerk.

UCS is a non-profit public corporation which conducts scientific and technical research concerning the social impact of advanced technologies. The organization was originally founded in the late 1960's as an informal faculty group at the Massachusetts Institute of Technology. It has grown into a coalition of scientists, engineers and other professionals concerned primarily with various health, safety, environmental and national security problems posed by the development of nuclear power plants in this country and abroad. UCS regularly prepares technical reports on various aspects of nuclear technology.[2] Its technical research is undertaken by a small staff in conjunction with contributions from broad segments of the scientific community in universities and other research organizations. UCS has a current public membership of approximately 35,000 sponsors who have contributed financially to support its work on nuclear technology issues.

Supplementary to its technical research activities, UCS's principal objective is to disseminate its independent analyses and judgments concerning issues associated with nuclear technology as widely as possible to the public. As a result of its work on nuclear power, over 2500 members of the American technical community endorsed the conclusions stated in a "Declaration on Nuclear Power" submitted by UCS to the Congress and the President on August 6, 1975. This declaration concluded, *inter alia*, that:

> ". . . nuclear fission creates massive amounts of radioactive by-products posing grave potential hazards which can only be controlled by an exceedingly high level of care, perception and diligence . . . .

[2] UCS's principal publication relating to the issues presented in these proceedings is: *The Nuclear Fuel Cycle: A Survey of the Public Health, Environmental, and National Security Effects of Nuclear Power* (M.I.T. Press rev. ed. 1975).

> No technically or economically feasible methods have yet been proven for the ultimate disposal of radioactive waste: a grim legacy from the nuclear program to future generations. Several proposals for dealing with the wastes exist, and one or more of these approaches may eventually be shown to be satisfactory, but important questions remain unanswered today about all of them." [3]

UCS's view is that "important questions [which] remain unanswered" about radioactive waste management and disposal have not been disclosd to the public by the Commission in a manner consistent with the National Environmental Policy Act of 1969 ("NEPA"). Unlike the federal respondents (Brief for Federal Respondents, page 34), UCS urges that a very substantial question under NEPA is presented for resolution by this Court. It is the position of UCS that the United States Nuclear Regulatory Commission,[4] when licensing nuclear power plants, has a legal responsibility under NEPA to develop a record disclosing to the public: (1) the present hazard

[3] A representative number of scientists who endorsed UCS's 1975 declaration have sponsored this brief. These individuals, whose affiliations are included solely for identification purposes, are: Hannes Alfven, Professor of Physics, University of California at San Diego and The Royal Institute of Technology, Stockholm, Sweden (Nobel Laureate); Christian B. Anfinsen, Chief, Laboratory for Chemical Biology, United States National Institute of Health (Nobel Laureate); James B. Conant, President Emeritus of Harvard University; John T. Edsall, Professor of Biochemistry Emeritus, Harvard University; Paul Kirkpatrick, Professor of Physics Emeritus, Stanford University; Salvador E. Luria, Professor of Biology, Massachusetts Institute of Technology (Nobel Laureate); Albert Szent-Gyorgyi, Director, National Foundation for Cancer Research (Nobel Laureate); James D. Watson, Professor of Biology, Harvard University, Director, Cold Spring Harbor Laboratory (Nobel Laureate).

[4] The United States Nuclear Regulatory Commission was created by the Energy Reorganization Act of 1974, 42 U.S.C. §§ 5801 *et seq.*, 5841 *et seq.*, succeeding the United States Atomic Energy Commission as the regulatory agency with licensing responsibilities for nuclear power plants. The word "Commission" is used in this brief to refer to both the NRC and the AEC.

created by producing radioactive waste; (2) the means of developing technologies designed to minimize the hazard; and (3) unresolved problems involved in the application of technologies to isolate radioactive wastes. UCS's principal objection to the Commission's actions is the inadequate quality of disclosure of these most serious environmental concerns. Many facts and uncertainties have not been considered by the Commission in a meaningful way and have not been disclosed to the public.

The interests of UCS, including its public membership and the scientists who have assisted in its research and policy positions, are adversely affected by the Commission's failure to examine in full detail the environmental risks and costs of producing radioactive wastes in a nuclear power plant. Members of UCS live near and enjoy the environment surrounding nuclear power plant sites and the numerous locations being investigated by the government for radioactive waste disposal sites. They risk injury due to the possibility that projected plans will not prove adequate to store and to dispose of radioactive wastes from nuclear power plants. The following consequences flowing from the Commission's inadequate analysis of the problems posed by radioactive wastes will directly affect the interests of UCS's members: (1) additional nuclear power plants will be constructed without a thorough assessment of commitments necessary to protect the environment; (2) grave, long-term risks of environmental contamination from radioactive wastes produced by those plants will inevitably be created; (3) numerous waste disposal sites throughout the United States will have to be investigated, designed, and constructed; and (4) the opportunity for Congress and the public to review the Commission's choices as to further use of nuclear power on a fully informed basis will be foreclosed.

UCS members also are concerned about the costs and risks passed on to future generations since radioactive wastes will remain toxic for hundreds of thousands of

years. They believe that continued licensing of nuclear power plants without a thorough and detailed understanding of the present and future burden of controlling radioactive wastes will result in an undue reliance by the United States on nuclear power. UCS's members have an interest in seeing that their energy needs are met without placing the unnecessary burden of the costs of radioactive waste disposal upon future generations.

Finally, UCS has a substantial organizational interest in this case. The purpose of NEPA is to ensure that an agency, such as the Commission, gives appropriate consideration to environmental values through fair procedures, full public disclosure, and reasoned responses to problems raised by responsible, independent scientific analyses. By participating in the rulemaking proceeding conducted by the Commission concerning the environmental impact of producing radioactive wastes (*App.* 352-400, 538-1339), UCS brought to the Commission's attention a range of important questions and issues requiring consideration. These factors include an assessment of the history of previous radioactive waste management efforts and an analysis of the options available for long-term disposal. UCS maintains that previous errors in the nuclear community's attempts to find a solution to the radioactive waste problem, and the uncertainties concerning whether proposed technologies can be implemented successfully to dispose of radioactive wastes permanently, present serious environmental considerations. UCS's interest in participating in those proceedings was to present independent scientific opinions to the Commission for the purpose of promoting the informed public and congressional oversight of environmental choices mandated by NEPA.

As Judge Learned Hand noted, the judiciary often needs ". . . the aid of unpartisan and authoritative scientific assistance in the administration of justice." *Parke-*

Davis and Co. v. *H. K. Mulford Co.*, 189 Fed. 95, 115 (S.D.N.Y. 1911). This need is acute in the environmental context, where the judiciary must review complex technical decisions in order to determine whether all relevant facts were taken into account, *e.g.*, *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402 (1971). UCS's position before this Court as *amicus curiae* is to indicate to the Court the failure of the Commission to respond to relevant considerations brought to its attention concerning radioactive waste management and disposal in the context of the *Vermont Yankee* licensing proceeding and the Table S-3 rulemaking.[4a]

STATEMENT OF THE CASE

A. Background

The factual issues raised in this case concern segments of the fuel supply system for uranium-fueled "light-water" nuclear power reactors. "Light-water" reactors, the principal reactor type used in this country, function by transferring to a natural water medium the heat generated by the fission of a particular uranium isotope. The transformation of natural uranium ore to a suitable form for reactor fuel, the use of the fuel for the production of electric power, and the subsequent management of the used

[4a] This brief deals solely with the nuclear fuel cycle issues subject to review in Docket No. 76-419 and is filed in Support of the Respondents in that case. However, UCS also urges affirmance of the Court of Appeal's decision in No. 76-528. In particular, the Commission's refusal to consider energy conservation issues in this Licensing case raises serious doubt concerning the willingness of the Commission to consider scientific and technical evidence in an open and fair manner. The techniques of energy conservation have been cited by the President as the "cornerstone of National Energy Policy. . . ." *The National Energy Plan*, Executive Office of the President, Energy Policy and Planning p. 28 (1977). The failure of the Commission to consider on its own initiative energy conservation as a reasonable alternative to licensing a nuclear power plant is both inconsistent with Presidential policy and indefensible as a scientific and environmental judgment.

uranium fuel comprise what is commonly designated the "uranium fuel cycle". This fuel cycle consists of a number of complex and discrete industrial and chemical processes, from the mining and milling of naturally occurring uranium ore to the ultimate management and disposal of used fuel and other radioactive waste by-products. The focus of this case is upon the environmental consequences of the segments of the uranium fuel cycle subsequent to the use of the fuel in light-water reactors.

The result of "burning" or "fissioning" of uranium fuel produces two categories of new radioactive substances. "Fission products," such as Strontium-90 and Cesium-137 are atomic "fragments" of split uranium atoms. "Actinides" and "transuranic elements," such as Plutonium-239, are all heavier atoms than uranium which are created when non-fissionable elements, usually Uranium-238, "capture" additional neutrons. The general term "radioactive wastes" refers to these substances contained in the used fuel elements along with plant structures, filters and other materials which become contaminated with these substances during the operation of the reactor, or activated by absorbing neutrons so as to become radioactive.

The risks of producing radioactive wastes by operating nuclear reactors arise from the extreme toxicity of fission products and actinides, and the consequent need to isolate these substances from bio-systems for periods of time which amount to "perpetual care" in comparison to human experience. Radioactive wastes include over 100 different "isotopes" or elements which are toxic and require environmental isolation. The most abundant and toxic long-term radioactive element in radioactive waste, posing a major health hazard, is Plutonium-239. With a half-life of approximately 25,000 years, Plutonium-239 must be isolated for 250,000 years before it becomes non-toxic. Plutonium's extreme toxicity is due to the fact that it

emits "alpha" radiation, a form of radiation of low penetration, which has a drastic impact upon exposed tissues. Even an exceedingly small particle of plutonium could cause lung cancer in a human being if inhaled. Plutonium accompanied by other actinides of comparable toxicity in used reactor fuel such as "amecurium" and "curium," will remain 1000 times more toxic than uranium ore for almost four million years while substances decay into stable, and thus radiologically benign, elements.[5]

Other elements in reactor fuel are shorter-lived but of equal concern in health and environmental terms. Strontium-90 and Cesium-137, two prevalent fission products, emit a type of radiation which can penetrate anything short of a thick shield of lead or concrete. They pose a hazard from *mere proximity*, and require isolation from the environment for "only" 600 to 1000 years in containers designed to block radiation and yet provide sufficient cooling to disperse the heat generated by radioactive decay. Strontium-90 is especially dangerous to humans, because of its chemical similarity to calcium. If ingested or absorbed in the human body, Strontium-90 lodges in bone cells and radiates the surrounding tissue continuously. Other elements in radioactive waste fuel have equally significant health effects because of their concentration in particular organs in the human body. For instance, the two radioactive isotopes of Iodine, Iodine-129 (with a half-life of 17 million years) and Iodine-131 (with a half-life of approximately 8 days) would, if ingested, concentrate in the thyroid gland. An isotope of Thechnetium concentrates in the gastrointestinal tract.

The adverse health effects caused by the absorption of these and other radioactive elements into human and other living tissue include the development of cancer in exposed tissues and possible genetic damage which would be

[5] *See generally, App.* 1075-79.

passed on to future generations in the form of various birth defects, mutations and diseases. *See, App.* 850-860. The realization of these adverse effects depends primarily upon the available environmental pathways through which radioactive wastes could impact directly upon human tissues. These pathways include direct inhalation from the atmosphere, absorption through drinking contaminated water, and exposure through a variety of plausable food chains in which radioactive elements have been concentrated, as well as mere proximity to certain elements such as Cesium-137. The goal of disposing of radioactive wastes is to close off all pathways through which the radioactive elements could come into contact with the human environment.

Unlike the steps associated with the production of uranium fuel, the adverse environmental consequences and the costs which must be incurred in order to implement measures to protect the environment and people from exposure to and injury from radioactive wastes are problematic and uncertain. The development and promotion[6] of nuclear power as a means of generating electricity over the past thirty years has given us substantial experience with the environmental effects of producing necessary supplies of uranium fuel. Accordingly, each step of the production of uranium fuel involves known environmental impacts, adverse consequences and resource commitments which have been previously experienced, and can be defined relatively easily on the basis of existing data. In contrast, most of the technologies and development steps

[6] The former Atomic Energy Commission had the dual responsibility of both regulating and promoting the construction of nuclear power plants. *See*, 42 U.S.C. §§ 2011-13. The Energy Reorganization Act of 1974 was passed in large measure to separate the regulation of nuclear power from its promotion. 42 U.S.C. § 5801(c); *see*, S. Rep. No. 93-980, 93d Cong., 2d Sess. 14-20 (1974) reprinted at 1974 U.C. Code and Cong. News 5470, 5483-89 (1974).

associated with the long-term management and control of radioactive wastes remain undefined by experience.[7]

The basic principle of commercial nuclear waste management has been to concentrate and to contain radioactive wastes in such a manner that *residual effluents* are small enough to be effectively diluted and dispersed in natural environments so as to pose no appreciable harmful risk to the human environment.[8] Present management programs for radioactive wastes consist of two basic categories—"high-level" waste disposal and "low-level" waste disposal. "High-level" wastes consist of highly radioactive and toxic elements initially contained in, and later

[7] The United States Government has gained substantial experience with the short-term storage of radioactive by-product materials from the military nuclear weapons program. These materials have principally been stored in carbon steel tanks. However, other practices, such as ocean dumping and the direct ground burial, have also been utilized. *App.* 1081-84; *see generally*, Lash, *et al., Citizen's Guide: The National Debate on the Handling of Radioactive Wastes from Nuclear Power Plants* 28-33 (Natural Resources Defense Council 1975). These techniques have proven to be unsatisfactory due to leakage, and are inapplicable for the disposal of radioactive wastes from commercial nuclear power plants:

> "Methods which were safe and acceptable for the management of the radioactive waste materials generated as a part of the U.S. wartime effort in the forties and the fifties, and which have been constantly improved over the years, are not considered acceptable for long-term application to management of radioactive wastes."

Pittman, F.K., *Management of Commercial High-Level Radioactive Waste* 2 (paper presented at the Massachusetts Institute of Technology, July 25, 1972).

[8] An element's radioactivity is commonly measured in "curies". A "curie" is defined as "a unit quality of any radioactive nuclide in which 3.7 x 10^{10} disintegrations occur per second." *Webster's New Collegiate Dictionary* 279 (1973). There are approximately 11 million curies of radioactivity in the wastes produced by a single reactor's yearly operation. A common method of measuring the potential toxicity of a radioactive substance is by stating the amount of water required to dilute one curie to drinking water purity. One curie of Strontium-90, for instance, requires about ten billion gallons.

removed and concentrated from, spent reactor fuel. "Low-level" wastes consist principally of contaminated objects used in nuclear reactor technology (including actual plant structures). These contaminated objects exist in vastly greater quantities than do high-level wastes, but with more dilute radioactivity. Due to their extreme toxicity, high-level wastes have been the principle focus of management and disposal problems, although low-level wastes present difficult problems of substantial dimensions.[9] The

[9] Low-level wastes consist of a variety of reactor components and by-products contaminated with radioactive elements during the fission process. They include filters, filter sludge, spent ion exchange resins, protective clothing, solid trash, packing materials, obsolete equipment, shielding, piping, instrumentation, control rods and other nuclear reactor materials. These wastes are processed and packaged in quantities of small radioactivity and buried in shallow land disposal sites. We do not concede that the Commission adequately addressed the long-term problems of low-level waste disposal in this case. However, since the treatment of high-level waste disposal by the Commission was so egregious, a remand of the proceedings is compelled on that issue alone. The general issues of low-level waste management and disposal are merely outlined here.

The most serious problem confronted in the shallow burial of low-level wastes is the movement or migration of radioactive materials, most notably "transuranic elements", from burial sites. Transuranic elements are radioactive elements which are produced artificially in course of reactor operation, which, typically, have a higher atomic number and higher mass than uranium. Migration has occurred at virtually all commercial (and military) low-level waste disposal sites.

Although most scientific investigators have come to the conclusion that a known, distinct health hazard has not yet been produced by migration, the foreseeable difficulties of disposing of the predicted vast quantities of low-level waste produced by the increasing use of nuclear power reactors have caused a good deal of concern. The fear is that migration from less than suitable burial sites will create a public health hazard and require costly corrective measures if the migration is monitored and detected in a timely manner. Many of the existing sites for low-level waste disposal were chosen without adequate investigation, and the potential for harm over the necessarily long isolation period is real. The need for a reappraisal of present policies has been asserted by the Comptroller General of the United States, and an investigatory panel of

need to dispose of high-level wastes permanently is the most serious unresolved environmental impact of licensing nuclear power plants. Thus, the resolution of major

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the National Academy of Sciences (NAS). A 1976 report of the Comptroller General concluded:

> "Each of the existing disposal sites has different hydrogeological and other characteristics. Some appear more suitable than others for retaining radioactivity. It is not presently known what mix of hydrogeological characteristics and engineering features offers the greatest assurance that radioactivity, once buried, will not migrate to create a public health hazard and require extraordinary and costly efforts to correct.
>
> "Because (1) disposal sites must retain radioactivity for an extremely long time, (2) migration has already been detected at some sites, and (3) USGS and EPA earth scientists have questioned the adequacy of the studies made at some existing sites, a comprehensive study should be undertaken at both ERDA-owned and commercial sites. If the public is willing to accept the risk of land disposal of radioactive materials, it has a right to assurance that radioactivity will be disposed of only at sites which are expected to retain it and prevent it from becoming a public hazard. The public also has a right to expect at least a concensus among earth scientists that disposal sites are suitable." Comptroller General of the United States, *Improvements Needed in the Land Disposal of Radioactive Wastes—A Problem of Centuries* 17 (January 12, 1976), reprinted in *Hearings on Low-Level Radioactive Waste Disposal before a Subcommittee of the Committee on Government Operations*, 94th Cong., 2d Sess. 377 (1976).

The panel of the NAS which issued a report on the problems of land burial cited the principal environmental cost of increased low-level waste production, the irreversible land use commitment which will be necessary.

The NAS panel recommended that a permanent repository, similar to a permanent "high-level" waste repository, be found for any transuranic contaminated low-level wastes; and that future low-level burial sites be selected on the basis of more thorough investigation and testing for hydrogeological and other criteria than has characterized the recent past in order to assess suitability for the containment of radioactive materials prior to use. National Academy of Sciences/National Research Council, *The Shallow Land Burial of Low-Level Radioactivity Contaminated Solid Waste*, xv-xvii (1976).

The panel also noted that the difficulties of finding suitable low-level waste burial sites are enhanced by the need to dispose of major

environmental, economic and technical considerations associated with the licensing of nuclear power plants remains unknown and undemonstrated.

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components of nuclear reactors themselves after the end of their useful life (approximately 30-40 years). Reactor "disposal" or "decommissioning" is virtually untested; the only practical experience has come from the decommissioning of small research reactors. It is anticipated that commercial reactor structures will be left as long-term memorials of the nuclear power age, after being decontaminated or gutted of the most radioactive internal components. The economic costs of this decommissioning process are "predicted" to be small in comparison with the benefits of nuclear power, but the long-term environmental costs associated with the disposal of reactor parts as low-level wastes may be substantial. The NAS panel recommended that immediate attention be given to designing functional reactor components in a manner calculated to reduce the need for and the difficulty of waste disposal:

> "This Panel is seriously concerned with the land burial problem that will present itself with the dismantling of present commercial nuclear power reactors as they become obsolete and are replaced. We believe much more thought must be given to the design of the fabric or basic structure of the buildings housing future commercial power-generating reactors, in order that their useful life can be extended even though their internal operational parts are replaced.
>
> "In other words, the Panel believes that reactors and other nuclear facilities should be specifically designed so that the radioactive parts of the power plant or other functional parts of the system could be removed and replaced at the end of their useful life without having to destroy or abandon the shielding, building walls, and other portions of the total facility. In this way, the future need for the disposal of solid low-level radioactive waste may be substantially reduced. Safe dismantling of the present monolithic, nearly indestructible structures of contemporary commercial nuclear power-generating stations presents a most difficult task. The methods for separation of the radioactive fraction of the debris from these structures for disposal cannot be considered lightly. This problem includes the dismantling and decommissioning of commercial nuclear power reactors, as well as of other commercial and ERDA nuclear facilities. The problem has not been discussed or presented in the body of this report, but is a general concern of the Panel." *Id.* at xvi.

B. The *Vermont Yankee* Decision

The instant proceedings arise from a challenge to the Commission's failure to thoroughly and completely consider the environmental impact of radioactive wastes which would be produced by the operation of the Vermont Yankee Nuclear Power Plant in Veron, Vermont. By the way of an initial and renewed motion, and requests to submit interrogatories to the Commission's staff and to the Vermont Nuclear Power Corporation, the Natural Resources Defense Council, Inc. ("NRDC") and other intervenors sought to compel consideration of the environmental impacts of radioactive waste management and disposal by the Atomic Safety Licensing Board.[10] *App.* 410-484.

[10] Nuclear power plants are licensed in a bifurcated adjudicatory process. An applicant to construct a nuclear power reactor must obtain a construction permit from the Commission and prove that it will construct the facility in accordance with a design which will comply with generalized criteria included in the Commission's regulations. After constructing the facility, the applicant must then obtain an operating license which will be granted by the Commission only after definitive findings are made that the operation of the nuclear power plant will not be inimical to either the health and safety of the public or common defense and security. 42 U.S.C. § 2235. At the construction permit stage full adjudicatory hearings are mandatory, and at the operating license stage any member of the public whose interest may be affected has a right to intervene and request an adjudicatory hearing. 42 U.S.C. § 2239, 10 C.F.R. § 2.714. These hearings are conducted by specially constituted Atomic Safety and Licensing Boards ("ASLB") of three members, two of whom generally are professional scientists or engineers, and one is generally an attorney. 42 U.S.C. § 2241, 10 C.F.R. § 2.721. The decisions of ASLB may be appealed to a similarly constituted Atomic Licensing Appeal Board. 10 C.F.R. §§ 2.762, 2.785(a). The decision of an Appeal Board is subject to review by the Commission, but becomes a final agency action if review is not undertaken by the Commission within 20 days. 10 C.F.R. § 2.786.

Subsequent to the passage of the National Environmental Policy Act of 1969, the Commission's initial inclusion of environmental issues in the licensing process foreclosed discussion of environmental matters when the actual adjudicatory hearings were conducted. This policy of avoiding environmental concerns in the actual decision-

NRDC further requested that the Commission's staff prepare a detailed environmental statement which included a complete assessment of radioactive waste management and disposal. All such motions and requests were denied. *App.* 410-411, 485-487; *see also, App.* 488-519.

Pursuant to the Commission's regulations, 10 C.F.R. 2.730(f), NRDC's motion was submitted to and denied by Atomic Safety and Licensing Appeal Board ("Appeal Board") in an interlocutory decision. *In re Vermont Yankee Nuclear Power Corp.*, ALAB-56, 4 AEC 930 (1972). *App.* 520-21, 112-129. The Appeal Board concluded that the future reprocessing,[11] management or disposal of the radioactive materials produced by a nuclear reactor could be treated as distinct from the operation of the reactor itself for NEPA purposes. The Board stated that broader consideration of the environmental effects of radioactive wastes in individual licensing proceedings could "call a halt to the licensing of individual reactors" because "[n]o power reactor could be licensed until every present and future reprocessing plant was studied in some depth. . ." *App.* 123. Furthermore, the Board asserted that the environmental aspects of the ultimate disposal of high-level radioactive wastes produced in spent reactor fuel were remote and "speculative":

> "Evaluation of the environmental aspects of the ultimate depository of the high-level wastes resulting

making process was rejected succinctly as inconsistent with the procedural requirements of NEPA in *Calvert Cliff's Coordinating Committee* v. *AEC*, 449 F.2d 1109 (D.C. Cir. 1971).

[11] "Reprocessing" is a complex industrial technique for separating out reusable plutonium and/or uranium from spent reactor fuel and recycling it for reuse in conventional reactors. There are no commercial reprocessing plants presently operating in the United States. On April 7 and 25, 1977, President Carter announced the policy of his administration to defer indefinitely any plans or proposals to reprocess nuclear fuel on the basis of national security, environmental and economic reasons. *See*, 13 Pres. Doc. 560 *et seq.*, 566 *et seq.* (April 25, 1977).

from reprocessing is at this time speculative, because it has not yet been determined what the nature and the location of the ultimate depository will be. That project will also of course be subject to independent analysis and procedures in compliance with the Environmental Protection [sic] Act, and it cannot be the subject of appropriate evaluation in this proceeding." *App.* 126-127.

In the Appeal Board's opinion, delay in considering the environmental effects of radioactive wastes creates as a necessary by-product of licensing a nuclear power reactor would not be inconsistent with NEPA. It felt that more detailed and accurate analysis of these environmental factors could be made sometime in the future, when waste facilities were constructed and disposal sites chosen. *App.* 120.

C. The Notice of Proposed Rulemaking

Shortly after the interlocutory decision by the Appeal Board,[12] the Commission issued a notice of proposed rulemaking suggesting two possible approaches for the generic treatment of environmental issues associated with the entire nuclear fuel cycle, including radioactive wastes, in individual licensing proceedings. 37 *Fed. Reg.* 24191 (Nov. 15, 1972); *App.* 352-360. The first alternative proposed in the Commission's notice would adopt the decision of the *Vermont Yankee* Appeal Board as a formal regulation.[13] *App.* 356. The second alternative proposed by the Commission's notice would incorporate a table developed in a report prepared by the Commission entitled *Environmental Survey of the Nuclear Fuel Cycle* (Nov. 1972)

[12] The decision of the *Vermont Yankee* Appeal Board became a final administrative action of the Commission pursuant to 10 C.F.R. § 2.786.

[13] The regulation would require consideration only of the environmental effects of transporting radioactive wastes away from the actual power plant site itself. *App.* 356.

("Environmental Survey"), App. 538-646. This table, denoted "Table S-3", set forth a series of numerical values representing projected cumulative quantities of land, water, and fossil fuels which would be utilized in nuclear fuel cycle activities. The Table also provided values for the expected chemical and radiological effluents in gaseous, liquid and solid form and thermal effluents which would be released to the environment by the operation of all nuclear fuel cycle activities. The exact numbers presented in the Table combined the postulated operations of all fuel cycle activities together. These "normalized," imaginary "environmental costs" supposedly represent the incremental impact of an average size nuclear reactor burning an average supply of fuel over its operating lifetime. *App.* 356-358. No value was included to represent the environmental cost of long-term radioactive waste disposal.

The Commission's rulemaking notice reduces the detailed consideration which would be given to the environmental impacts of producing radioactive wastes to "certain" and allegedly "insignificant" numerical values. *App.* 356, 394-95. The Commission supported its approach with the following statement:

> *"Cost-benefit analyses of nuclear power reactor license applications should contain a full and frank disclosure and consideration of costs and benefits of the proposed action. The results of the application of this principle to the question of inclusion of environmental effects associated with the fuel cycle are not entirely clear.* As the above discussion indicates, the fractional contribution, if any, of the environmental effects of the fuel cycle to the cost-benefit balance for a particular nuclear reactor is difficult, and may be impossible, to ascertain with any degree of certainty. This suggests that such matters, if they are to be considered at all, be considered in a generic fashion through the rulemaking

process. The Commission's regulatory staff has prepared a report entitled "Environmental Survey of the Nuclear Fuel Cycle", dated November 6, 1972, which provides a basis for an informed consideration of the generic question of the environmental impact associated with the uranium fuel cycle in light water cooled nuclear power reactor license proceedings." *App.* 355 (emphasis added).

The reduction of acknowledged uncertainties of the development of waste management and disposal technologies to numerical results was based upon significant assumptions. It was presumed by the Commission in the "Environmental Survey" that: (1) all necessary technologies for handling radioactive wastes were sufficiently developed to implement a complete system resulting in ultimate disposal without further technical advances; see, *App.* 542, 579, 1201, 1242; (2) no future technological barriers would be encountered in the implementation of waste management and disposal systems which would affect environmental costs; *see*, *App.* 610-618; (3) human or technical accidents or failures would be of such limited likelihood that they need not be considered as relevant environmental costs; *see*, *App.* 570-576; 601-606; 623-24; (4) all technological systems would operate within theoretically calculated margins of environmental impact; *see* *App.* 545-550; and (5) the residual environmental impact of an average "model" system could substitute for a detailed discussion of the environmental effects of developing, demonstrating and commercializing different technological options which may be used to manage and dispose of nuclear wastes; *see*, *App.* 542-580.[14] These assumptions

[14] The Commission's entire analysis of the problems of radioactive waste management were premised upon the existence and environmental impacts of reprocessing plants. *See, e.g., App.* 580-609. A reprocessing plant, while recycling reusable nuclear fuel, would produce liquid and gaseous streams of remaining radioactive wastes. These waste quantities would then have to be solidified and stored, prior to ultimate disposal. Since the President has indefinitely deferred commercial reprocessing (*see* note 11, *supra*), the Commission's analysis of reprocessing is obsolete. Most significantly here, the Commission has relied upon the acceptability of long-term disposal of radioactive wastes from reprocessing. The alternative of simply disposing of spent fuel intact, commonly referred to as the "throwaway fuel cycle" has not been examined. Special considerations, requiring detailed technical investigation, exist relative to the disposal of intact spent fuel. For instance, study of the risks of chemical reactions between the metal cladding surrounding the fuel and possible disposal mediums, such as salt deposits (*see* pages *infra*), is necessary. Another significant problem would be the vastly increased concentration of plutonium in the wastes. These problems now deserve the detailed examination required by NEPA before additional nuclear power plant licenses are granted.

Reprocessing itself did not result in the rosy picture painted by the Commission in its rulemaking proceeding. The only reprocessing plant to operate in the United States, located at West Valley, New York, closed down for environmental modifications in 1972 and now has been permanently abandoned. The plant has been labelled a "technological and economic disaster" and a "misadventure that may end up costing the taxpayers of New York half a billion dollars, or a billion dollars, or even more. . ." in order to clean up the on-site high-level waste. Severo, *Too Hot to Handle*, New York Times Magazine, April 10, 1977. *See*, *App.* 1198-51.

alone lead the Commission to conclude that the technologies, industrial activities and environmental safeguards which will be implemented to protect the human environment from radioactive wastes are sufficiently predictable that future impacts can be conservatively estimated to be within the limits of a table of numerical values.

The only apparent basis for these critical assumptions concerning high-level radioactive waste disposal was the testimony of one witness, Dr. Frank K. Pittman.[15] Dr. Pittman discussed in some detail the *concept* of a temporary "Retrievable Surface Storage Facility" which theoretically could store radioactive waste cannisters until a permanent disposal site was found. On the issue of permanent disposal, Dr. Pittman merely concluded that the problem will be solved by virtue of,

[15] Dr. Pittman's testimony was not included in the actual "Environmental Survey" but was presented at the rulemaking hearing *App.* 776-799.

". . . the rather extensive program of research, development, testing, design, construction and pilot plant operation underway on the bedded salt concept, . . . [and] a thorough evaluation of all other potentially attractive near- and long-term disposal concepts in order to: (1) assure that no feasible concept has been overlooked; and (2) lay the groundwork for future programs, should the work on bedded salt not result in acceptability of that concept for very long-term disposal." *App.* 790-791.

No further detail on the costs and risks of the research program or on the likelihood and contingencies of its success or failure was provided by the Commission or its witness.

1. *Objections to the Nature of the Rulemaking Proceedings*

The objections made by UCS to the Commission's rulemaking proceeding were premised upon the total lack of any meaningful opportunity to inquire into the assumptions contained in the "Environmental Survey" and the Table S-3 rule.[16] Neither narrow option proposed by

[16] In conjunction with another party to the rulemaking proceedings, UCS filed a detailed legal critique of the procedural rights afforded by the Commission. *App.* 1035-57. The legal statement specifically requested that the Commission grant an opportunity for the use of adjudicatory procedures, including discovery and cross-examination, in the rulemaking hearing. The critical premise to these arguments was that UCS believed that it was impossible for the Commission to make a reasoned judgment of the issues given the limited framework for decision-making, the narrow choice of only two alternative rules and the nature and complexity of the factual and policy issues presented.

The use of adjudicatory procedures may well have alleviated some of these problems, and assisted in the development of a legally sufficient record. *See generally*, Hamilton, *Procedures for the Adoption of Rules of General Applicability: The Need for Procedural Innovation in Administrative Rulemaking*, 60 Calif. L. Rev. 1276 (1972); Clagett, *Informal Action—Adjudication—Rulemaking: Some Recent Developments in Federal Administrative Law*, 1971

the Commission as a means for incorporating the effects of fuel cycle activities into the environmental review accompanying reactor licensing decision provides any substantive analysis of problems and uncertainties in the present program of radioactive waste management. *See, App.* 1038-1043; 836-845. Most significantly, neither the proposed rule nor the underlying analysis in the "Environmental Survey" present a detailed evaluation of the multiple means being investigated as solutions to the high-level waste isolation problem, and the environmental costs of pursuing one or more of these techniques.

The Commission has simply ignored the actual experiences of government efforts to manage and to dispose of high-level radioactive wastes. Through written submissions and oral testimony, UCS articulated its concern on the record that there is no basis for the assumption that long-term waste isolation can be implemented at the present time. *App.* 1068-1107, 894-898. Rather than disclosing negligible numerical values to reflect to the Congress and the public the impact of producing radioactive wastes, UCS contended that the Commission should analyze and disclose the technical barriers which must be overcome prior to the implementation of a complete, adequate and environmentally acceptable system of controlling radioactive wastes. This would include an examination of the vast array of technologies which *may actually be implemented* to isolate radioactive wastes: varying methods of burial in stable geological structures, deep ocean burial, extra-terrestrial disposal, *et cetera. App.* 1084-1098. UCS seriously questioned the legitimacy of the goal of a proceeding which sought to define radioactive waste impacts as certain quantities, on the basis of theo-

Duke L.J. 51; Boyer, *Alternatives to Administrative Trial-Type Hearings for Resolving Complex Scientific, Economic and Social Issues*, 71 Mich. L. Rev. 111 (1972). However, since the Commission has totally failed to produce an adequate record, this Court need not reach these issues. *See* pages 46-47, *infra*.

retical calculations which ignored past problems and failures even to develop the technologies upon which the calculations were based. *App.* 837-838, 841-844, 894-898, 1072-1073.

The rulemaking hearing board reported a number of these concerns to the Commission. *App.* 364-378. The hearing board suggested a possible reexamination of the limitation of the proceedings to two alternative rules in light of the hearing record. *App.* 375-376. The hearing board also questioned whether a more extensive analysis of the long-term environmental effects of radioactive waste disposal was necessary, and would require a substantial revision of the "Environmental Survey." *App.* 372-73, 374. Finally, the hearing board proposed that the record may indicate that the methodology of basing environmental effects upon non-existant model facilities may not warrant the conclusion that the impact of producing radioactive wastes is negligible. *App.* 374.

2. *The Implementation of the Table S-3 Rule in the* Vermont Yankee *Case*

The Commission designated Table S-3 as its final rule, exclusively defining the environmental impacts of the nuclear fuel cycle. 39 *Fed Reg.* 14188 (April 22, 1974) (*App.* 385-400). The Commission made no meaningful response to the issues raised by UCS and reflected in the report of the hearing board. In its decision, the Commission acknowledges that Table S-3 and its underlying analysis in the "Environmental Survey" is neither a generic environmental impact statement filed pursuant to section 102(2)(c) of NEPA, nor ". . . an analysis of alternatives and costs and benefits of the entire uranium fuel cycle." *App.* 386. The sole purpose of the "Environmental Survey" was to serve as a "data base" for a rule implementing NEPA. *Id.* The salient conclusion of the rulemaking was that the actual problems of radioactive waste need not be fully considered as part of an environmental impact

statement prepared when nuclear power plants are licensed, because the risks posed by such wastes are "insignificant." *App.* 394-95. The Commission ruled that the environmental effects of radioactive waste would be considered in the future by simply incorporating the negligible values stated in Table S-3 into its licensing decisions.

In the final adjudication of the *Vermont Yankee* case, the Appeal Board cited the rulemaking proceeding as the final word on radioactive waste issues:

> "Whatever doubt there may have been concerning the correctness of the result reached in [the interlocutory decision] has been eliminated by the convening of [the uranium fuel cycle] rulemaking proceeding." *App.* 137.

Therefore, the Vermont Yankee Nuclear Power Plant was granted a license to operate and to produce radioactive wastes without any real consideration of the risks, costs and impacts of the necessary long-term management and isolation of those wastes. The Commission's refusal to consider these issues in the *Vermont Yankee* environmental impact statement is paralleled by the refusal, codifided in Table S-3, to permit any further inquiry into the environmental impacts of radioactive wastes beyond the limits set forth in the final rulemaking decision.[17] The final *Vermont Yankee* EIS simply states:

> "Long-lived radioactive materials will be produced by fission of nuclear fuel in the core of the reactor and neutron activation of reactor parts near the core. The eventual disposal and storage of radioactive materials will require a certain amount of space, probably in an area remote from this planet, for a very long period of time, and would for all practical purposes be considered as an irreversible commitment of resources." *App.* 536.

[17] 10 C.F.R. § 51.20(e) provides, ". . . No further discussion of such environmental effects shall be required." *App.* 398.

D. Proceedings Subsequent to the Decision Below

On July 21, 1976, a three-judge panel of the Court of Appeals for the District of Columbia determined that the Commission's exclusion of detailed consideration of the environmental impacts of radioactive wastes from nuclear power plant licensing review under NEPA was deficient both procedurally and substantively. *Natural Resources Defense Council* v. *NRC*, 547 F.2d 633 (D.C. Cir. 1976) *App.* 28-88. As Judge Tamm noted in his concurring opinion:

> "NEPA requires the Commission fully to assure itself that safe and adequate storage methods are technologically and economically feasible. It forbids reckless decisions to mortgage the future for the present glibly assuring critics that technological advancement can be counted upon to save us from the consequences of our decisions . . . . [*I*]*t is impossible to determine from the record before us whether the Commission has fulfilled its statutory obligation under NEPA in adopting the S-3 Table, in effect deciding that the incremental environmental effect of storing the waste of an additional nuclear reactor is negligible, or whether it has uncritically adopted as its own the undocumented conclusions of a single witness that the waste storage issue is a 'non-problem'* with which the Commission need hardly concern itself at this time." 547 F.2d at 658, *App.* 78-79 (emphasis added).

In response to the Court of Appeals decision, the Commission has developed an "interim" rule which is virtually identical to the Table S-3 rule in form and substance. 42 *Fed. Reg.* 13803 (March 14, 1977). The interim rule which has the effect of a final rule pending completion of reopened hearings, merely modifies Table S-3 slightly and includes a numerical value of 11 million curies per average reactor year to reflect the impact of long-term waste disposal.[18]

[18] The interim rule was based upon a revised survey of the previous analysis by the Commission's staff. *Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle*, NUREG-0116 (Supp. 1 to WASH.-1248) (Oct. 1976). No consideration was given in this survey to alternative means of disclosing the environmental effects of producing radioactive wastes aside from the publication of a revised table of numerical values in environmental impact statements. Minor changes in the values set forth in the original Table S-3 were made. The value of 11 million curies represents the high-level wastes buried at a "federal repository." *Id.*, "Table 2.10" at 2-33. The survey itself was admittedly not a complete environmental impact statement.

In conjunction with its interim rule, the Commission states that radioactive wastes will be "buried" at a federal repository," but acknowledges that a federal repository does not exist and that "uncertainties" are present "[w]ith respect to risks from long term repository failure." 41 *Fed. Reg.* 45849, 45850-51 (Oct. 18, 1976). These uncertainties are explained away because, ". . . [i]n areas where information necessary for a complete quantitative assessment of environmental impacts is lacking . . . Federal programs are underway to resolve existing uncertainties." *Id.* A two-page summary of the plans of the Energy Research and Development Administration to locate and to demonstrate a feasible high-level radioactive waste repository for long-term disposal is included as an appendix to a supplement to the revised "Environmental Survey."[19] No further information is provided concerning the costs and risks perceived necessary for the successful development and implementation of the technology to dispose of radioactive wastes permanently.

The critical assumption that radioactive wastes will be isolated permanently from the human environment by technological advancement has not been probed further by the Commission. As one member of the Atomic Safety and Licensing Appeal Board recently asserted:

> "[There is] some question about the nature of the consequences that we should assume might flow from the existance of the high level radioactivity postulated by the [revised] Table.

[19] *Id.* at Appendix B-1-3.

> "I have now come to the conclusion that, regardless of any uncertainty it perceives on the matter, the Commission intends those charged with applying Table S-3 to assume that the eleven million curies of waste generated in each year of a typical reactor's operation remain in place in the postulated repository and do no damage whatsover . . .
>
> "[A]lthough the Commission referred to uncertainties concerning waste repository failure in proposing the interim rule, it indicated when it adopted the rule that it meant us to discount these uncertainties entirely . . . .
>
> "The only way to conclude that there is no substantial difference between (1) not mentioning high level wastes at all and (2) representing it in terms of eleven million curies per average reactor per year, is to assume that the waste remains in place permanently and presents no threat at all to human safety of the environment."

Vermont Yankee Nuclear Power Corp. and Public Service Company of New Hampshire, et al., ALAB-421, —— NRC —— (July 18, 1977) (concurring opinion of Mr. Farrar).

SUMMARY OF ARGUMENT

The Commission must consider the environmental effects of producing radioactive waste by-products from nuclear power plants during the licensing process. Just as it would be illogical and illegal to fail to consider the production of air pollutants by a coal-fired power plant, it is inconsistent with NEPA to ignore the fact that nuclear power plants produce toxic radioactive materials which present a grave, long-term risk to the human environment. The need to manage and dispose of radioactive wastes is a direct and substantial environmental impact caused by the operation of a nuclear power plant, which bears significantly on the choice between the nuclear

option and its alternatives. It therefore deserves the most "searching scrutiny" before irreversible commitments are made without a full, current understanding of the costs and risks involved.

The Commission's rulemaking proceeding, while acknowledging that the production of radioactive wastes is a component of the nuclear licensing decision, was not based upon a consideration of relevant factors and did not constitute a reasoned exercise of administrative decision-making. The Commission failed to make any showing, based upon evidence, scientific data or proposed technology development programs, to support its conclusion that the serious environmental problems posed by the production of radioactive wastes are "relatively insignificant."

The Court of Appeals found that the factual basis and reasoning supporting the rule allegedly designed to implement NEPA was deficient. The Court did not declare the rulemaking procedures illegal, but correctly found that the rulemaking decision was based solely on the inadequate and conclusory assurances of one witness, Dr. Frank K. Pittman. Dr. Pittman's testimony was not only inadequate because it was unacceptably vague and general, but also insufficient to support the Commission's rule because it did not even deal with the most significant environmental impact, the need to develop methods for permanent radioactive waste disposal. When faced with substantial criticism of Dr. Pittman's presentation, the Commission did not give a reasoned explanation of its final decision or its basis for ignoring the opinions of other qualified scientists and the history of our failure to achieve projected waste disposal goals.

The only explanation offered by the Commission to support its limited consideration and disclosure of the risks and costs necessitated in order to control radioactive wastes was an assertion that the Commission did not real-

ly intend to analyze the environmental effects in detail. The Commission candidly admits, after the fact, that the purpose of the rulemaking was only to develop a "data base" for deriving numerical predictions of environmental end results, after *postulated technologies* were applied to manage radioactive wastes. Neither facts nor reasoning can be found in the record to provide a rational basis for the approach or conclusions of the Commission.

The Commission sweeps under the rug known environmental problems associated with radioactive waste disposal by applying the mystique of technical expertise. It unacceptably attempts to implement NEPA by crystal ball prophecy, rather than through full disclosure of present environmental risks and costs. The result reached in the Commission's rulemaking reduces environmental concerns beyond rational comprehension. Only a table of "relatively insignificant" numbers is proposed to inform Congress, the public, other federal agencies and others removed from the decision-making process what the implications of producing radioactive wastes are. Therefore, until the Commission implements a means whereby the environmental effects of radioactive wastes can be given full consideration, rather than reduction of hypothetical numerical values, the congressional mandate of NEPA has not been met.

ARGUMENT

I. THE NATIONAL ENVIRONMENTAL POLICY ACT REQUIRES THAT THE COMMISSION GIVE DETAILED CONSIDERATION TO THE PRODUCTION OF RADIOACTIVE WASTES BEFORE IT DECIDES TO GRANT NUCLEAR POWER PLANT LICENSES

A. Consideration of Environmental Issues in Nuclear Plant Licensing

The licensing of the Vermont Yankee Nuclear Power Plant is admittedly a "major federal action . . . significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(c). When determining whether to grant nuclear power plant licenses, the Commission regularly prepares an "environmental impact statement" ("EIS") pursuant to section 102(2)(c) of the National Environmental Policy Act of 1969, 42 U.S.C. § 4331 *et seq.*, ("NEPA").

The EIS evaluates in detail the environmental effects of the proposed nuclear plant and reasonable alternatives which could be implemented to satisfy or to reduce the need for energy. This detailed statement compares the need for and alleged benefits of the proposed nuclear power plant, the costs and benefits of various designs and sites for the nuclear facility, and the environmental consequences of various nuclear proposals and non-nuclear alternatives. The EIS becomes part of the administrative record, and is subject to the adjudicatory process of decision-making before Atomic Safety and Licensing Boards, Atomic Safety and Licensing Appeal Boards, and the Commission itself. *See, Calvert Cliffs Coordinating Committee* v. *AEC*, 449 F.2d 1109 (D.C. Cir. 1971).

In the *Vermont Yankee* EIS, the Commission has included an extensive discussion of environmental issues relevant to the operation and siting of the nuclear power plant. That discussion is generally consistent with the broad policy objectives of NEPA. The effects of the plant upon surrounding lands, the impact of complex cooling systems upon aquatic life, the radiological releases into the local environment and numerous other issues relating to the normal operation of a nuclear power plant are studied and examined rather thoroughly in comparison to the impacts of reasonable alternatives. Following its normal methodology, the Commission has balanced the costs and risks of various options analyzed in the EIS from an environmental point of view against economic and technical factors. *Cf., Citizens for Safe Power* v. *NRC*, 524 F.2d 1291, 1298-1301 (D.C. Cir.

1975). However, also following its usual practice, the Commission has largely ignored the production of nuclear wastes as an environmental consequence of licensing the nuclear power plant itself.

B. The Production of Radioactive Wastes is an Inevitable and Substantial Environmental Impact of Licensing a Nuclear Power Plant

Unlike a coal-fired power plant, or any other means of generating electricity or producing energy, a nuclear power plant inevitably causes substantial and significant long-term environmental consequences by producing radioactive wastes. Those consequences are so serious that they require an unprecedented need for human care and vigilence. An "environmental impact" of licensing nuclear power plants is clearly the production of radioactive wastes and the dangers created by their presence in the environment. 42 U.S.C. § 4332(2) (C) (i).

Each licensing of a nuclear power plant commits the nation to finding a means of isolating its wastes from the human environment for hundreds of thousands of years in order to prevent irreversible injury to the environment and human beings. Once a series of nuclear power plants are licensed, the nation inevitably has committed itself to major technological research, development, and implementation of programs to develop means of dealing with the cumulative inventory of radioactive wastes. Thus, the environmental impact of licensing nuclear power plants inextricably includes the efforts necesary to adequately manage and isolate radioactive wastes, and the costs and consequences of the failure or success of those efforts.[20]

[20] It is admittedly within the discretion of the Commission to evaluate the environmental effects of radioactive wastes on the public record in generic or in individual licensing proceedings. 547 F.2d at 641 and n. 17; *App.* 38-40 and n. 17. As the Court of Appeals noted, the imperative obligation of NEPA is for the Commission "to break the cycle of . . . incremental decision-making." *Id.* at 640; *App.* 38. The *Vermont Yankee* Appeal Board's decision would perpetuate non-compliance with NEPA's mandate solely on the premise that procrastination may produce a more "detailed" statement. But, procrastination of basic NEPA responsibilities would actually ignore critical environmental issues which should be disclosed to the public and Congress forthwith:

> "The real question posed by the Board's opinion is whether the environmental effects of the wastes produced by a nuclear reactor may be ignored in deciding whether to build it because they will later be considered when a plant is proposed to deal with them. To answer this question any way but in the negative would be to misconstrue the fundamental purpose of NEPA. Once a series of reactors is operating, it is too late to consider whether the wastes they generate should have been produced, no matter how costly and impractical reprocessing and waste disposal turn out to be; all that remains are engineering details to make the best of the situation which has been created." 547 F.2d at 640; *App.* 37-38 (footnotes omitted).

Furthermore, NEPA's "action-forcing" disclosure requirements were passed by Congress for the purpose of continually reviewing past determinations and programs and their alternatives from an environmental viewpoint. *See, e.g., NRDC* v. *Morton*, 458 F.2d 827, 833-34, 836 (D.C. Cir. 1972). The Commission's past licensing actions are by no means a bar to considering the problem of radioactive waste disposal as soon as possible. Other more environmentally benign energy alternatives may be foreclosed in the future by the unexamined costs of controlling more and more radioactive waste. *Cf., Scientists Institute for Public Information* v. *AEC*, 481 F.2d 1079, 1089-90 (D.C. Cir. 1973).

Despite a public acknowledgement that radioactive wastes ". . . pose the most severe potential health hazard and the most complex technical problems in management . . .," [21] the Commission has failed to disclose in its *Vermont Yankee* EIS the commitments which will be necessary, the health hazards which must be endured, and the problems which must be overcome. The failure to discuss these facts in an environmental assessment violates the principal mandate of NEPA:

[21] Fox, *Radioactive Wastes*, AEC No. IB-508 at 12 (rev. ed. 1969). (This publication was issued by the Commission as a public information handbook).

"[W]hat is required is information sufficient to permit a reasoned choice of alternatives so far as environmental aspects are concerned." *Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 836 (D.C. Cir. 1972).

C. The Plain Language of NEPA and its Legislative History Establish a Duty to Consider Fully the Environmental Implications of Producing Radioactive Wastes

The central legal inadequacy of the Commission's minimal disclosure of the hazards and consequences of radioactive waste production is the lack of any discussion of environmental problems in terms of the qualities specifically designated in NEPA. These problems are a paradigm of those meriting disclosure under section 102(2)(c) of NEPA: the impact of the action is the actual creation of radioactive waste and its accompanying hazards (42 U.S.C. § 4332(C)(i)); an irreversible commitment of resources to the development of means to manage and dispose of the wastes is required (42 U.S.C. § 4332(2)(C), (iv)); risks that accidents, technical or human failures will cause irreversible environmental contamination are created (42 U.S.C. § 4332(2)(C)(ii), (iv)); and a predetermined preference for sacrificing an amount of long-term productivity in exchange for short-term benefits is made (42 U.S.C. § 4332(2)(C)(v)). As Senator Jackson, one of the principal sponsors of NEPA, emphasized, treatment of environmental factors in these terms is essential to justify major federal actions:

> "Subsection 102(c) [enacted as 102(2)(c), 42 U.S.C. § 4332(2)(C)] establishes a procedure designed to insure that in instances where a proposed major Federal action would have a significant impact on the environment that the impact has in fact been considered, that any adverse effects which cannot be avoided are justified by some other consideration of national policy, that short-term uses are consistent with long-term productivity, and that irreversible and irretrievable commitments of resources are warranted." 115 Cong. Rec. 29055 (Oct. 8, 1969).

The legislative history of section 102(2)(c) of NEPA, the so-called "action-forcing" provision of the law, clearly establishes the policy objective of directly incorporating relevant environmental issues into the process of agency decisionmaking:

> ". . . [T]o make policy effective through action, a comprehensive system is required for the assembly and reporting of relevant knowledge; and for placing before the President, the Congress and the people, for public decision, the alternative courses of action that this knowledge suggests."

L. Caldwell, *A Special Report to the Senate Committee on Interior and Insular Affairs: A National Policy for the Environment*, 10-11, 90th Cong., 2d Sess. (Committee print July 11, 1968), *reported at* 115 Cong. Rec. 12126, 12129 (Oct. 8, 1969); *see generally*, S. Rep. No. 91-296, 91st Cong., 1st Sess. (1969).

The Commission's actions reduce consideration of the environmental impact of producing radioactive wastes to ludicrous proportions. The *Vermont Yankee* EIS contains a simple statement concluding that the wastes will be isolated sometime, somewhere and somehow in a safe manner. *App.* 533. The "Table S-3" rulemaking proceedings conclude that this "Alice in Wonderland" statement of the environmental impact need not be expanded because the problems of radioactive waste disposal are "relatively insignificant". *App.* 393-94. No attempt is made to describe environmental risks which must be endured, or resource commitments which will be required to turn the present reality of unresolved environmental protection problems into a future of insignificant and negligible effects. The exclusive focus of the Commission is a pre-

diction that, in the end, technologies will be implemented to reduce adverse consequences to impacts which can be disclosed in terms of conclusory "numerical values".

The legislative history and express language of section 102(2)(c) of NEPA forbids this type of approach. *See generally*, S. Rep. No. 91-296, 91st Cong. 1st Sess. (1969). Even if the Commission's judgment about the application of future technologies was unequivocally correct, the duty set forth in NEPA is the disclosure of costs, risks, and other factors relevant to the attainment of projected environmental protection goals. The Commission has concluded merely what those goals are, rather than providing information sufficient to allow others to determine whether the process of attaining environmental protection from radioactive wastes may be too great or too risky in comparison to alternatives to a nuclear power plant. The purpose of the section 102(2)(c) impact statement is to fulfill this latter objective:

> "[T]he requirement of a detailed statement helps insure the integrity of the process of decision by precluding stubborn problems or serious criticisms from being swept under the rug. A conclusory statement 'unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind' not only fails to crystallize issues, *Natural Resources Defense Council* v. *Grant*, 355 F.Supp. 280, 287 (E.D. N.C. 1973), but 'affords no basis for a comparison of the problems involved with the proposed project and the difficulties involved in the alternatives.' *Monroe County Conservation Council* v. *Volpe*, 472 F.2d 693, 697 (2d Cir. 1972)."

Silva v. *Lynn*, 482 F.2d 1282, 1285 (1st Cir. 1973); *see also*, *Environmental Defense Fund* v. *Corps of Engineers*, 492 F.2d 1123, 1133-37 (5th Cir. 1974); *Sierra Club* v. *Froehlke*, 486 F.2d 946, 950-51 (7th Cir. 1973); *Environmental Defense Fund* v. *Corps of Engineers*, 470 F.2d 289, 295-96 (8th Cir. 1972), *cert. denied*, 412 U.S. 931

(1973); *Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 833-34, 836-38 (D.C. Cir. 1972); *Calvert Cliffs Coordinating Committee* v. *AEC*, 449 F.2d 1109, 1112-15 (D.C. Cir. 1971).

As this Court has made clear in *Kleppe* v. *Sierra Club*, 427 U.S. 390 (1976), an agency must disclose the present reality of environmental consequences of existing proposals. The hoped-for end-results of future proposals do not provide the information necessary for a choice between alternative courses of action on the basis of current environmental knowledge and circumstances. Here, the nuclear licensing proposal dictates substantial future risks and costs. The *unavoidable adverse consequences* of the nuclear power plant licensing proposal include the further actions compelled in order to protect the human environment from the radiological hazard of its wastes. The controversies surrounding the development of methods of achieving this goal, and the Commission's evaluation of the process of resolving the environmental hazard created must be presented explicitly in a record compiled pursuant to NEPA.

D. Environmental Factors Must be Considered Contemporaneously with Causative Proposals for Action

The decision of the Court of Appeals below affirms the principle that an agency ". . . make reasonable forecasts of the future [and] predict the environmental consequences of its decisions as it makes them." 547 F.2d at 639-40; *App.* 36-37. *See, Kleppe* v. *Sierra Club*, 427 U.S. 390, 401-02, 409 (1976) (*"Kleppe"*); *Aberdeen & Rockfish Railroad Co.* v. *SCRAP*, 422 U.S. 289, 320 (1975) (*"SCRAP"*). This principle is premised upon the fundamental policy goal of NEPA to provide timely information concerning environmental factors so that agency decision-making is fully informed. Without adequate in-

formation, neither Congress, interested agencies, state governments, nor the public can intelligently weigh environmental problems against other goals. Agency decisions which arguably should be reversed or revised before irreversible actions are taken will be left intact. *See, e.g.*, *Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 833 (D.C. Cir. 1972); *Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F.2d 1109, 1113-15 (D.C. Cir. 1971).

The relegation of environmental problems to future review was considered expressly inconsistent with the legislative purposes of the Act:

> "Policy is established by default and inaction. Environmental problems are only dealt with when they reach crisis proportions. Public desires and aspirations are seldom consulted. Important decisions concerning the use and shape of man's future environment continue to be made in small but steady increments which perpetuate rather than avoid the recognized mistakes of previous decades."

S. Rep. No. 91-296, 91st Cong., 1st Sess. 5 (1969).

The Commission's primary rationalization for not providing a detailed statement of the environmental problems of isolating radioactive wastes in the *Vermont Yankee* case conflicts with this policy. The Commission argues that radioactive waste problems are "remote" and "speculative" at the time a power plant is licensed. The Commission therefore believes that it would be "more appropriate" to analyze the problems when actual waste management and disposal technologies are implemented. *App.* 119-120, 394, 397. The Petitioner, in support of the Commission's determinations, relies upon the holdings in *Kleppe* and *SCRAP* which have interpreted section 102 (2) (c) of NEPA not to require a detailed examination of environmental problems caused by actions removed from a present proposal by time or location.

This reliance is misplaced. The relationship between radioactive waste production and nuclear power plant licensing does not involve a distinction between present proposals and actions merely "contemplated" or separately planned. Rather, the issue presented here concerns the quality of disclosure required by NEPA for a particular set of environmental consequences of the licensing decision. The separation of the environmental risks of producing radioactive wastes from licensing decisions on the basis of a distinction between immediate *actions* and long-term *impacts* would draw an "arbitrary and capricious" boundary foreclosing timely assessment of the environmental factors. Environmental costs and risks arise from producing the radioactive wastes in the first place, not some time later, when an irreversible commitment has already been made.

The critical standard applicable to this case, which establishes when specific environmental issues must be considered under NEPA, is causation. When known proposals for action of concrete dimensions cause specific environmental consequences, those consequences must be given detailed consideration in comparison to the consequences of alternatives. If consideration of environmental factors is delayed until some time after causative federal actions have been approved, the "hard look" at environmental consequences will not be taken until it is too late to "assess" and to "weigh" in individual cases "the particular economic and technical benefits . . . against the environmental costs." *Calvert Cliffs Coordinating Committee* v. *AEC*, 449 F.2d 1109, 1123 (D.C. Cir. 1971). Furthermore, environmental consequences will be created despite subsequent remedial actions, and despite the existence of foregone alternatives which could have "alleviated a significant portion of environmental harm" and provided options to foreclose environmental problems "while they are still of manageable proportions." *Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 836

(D.C. Cir. 1972); *see*, S. Rep. No. 91-296, 91st Cong., 1st Sess. 5, 12-13 (1969).

The President's Council on Environmental Quality ("CEQ"), which was specifically designated by Title II of NEPA (42 U.S.C. § 4341 *et. seq.*) to develop guidelines for other agencies in the implementation of section 102(2)(c), has reiterated the importance of recognizing long-term consequences of immediate actions in impact statements. First, the CEQ has concluded that the secondary effects of proposals, occurring at a later date, may be very substantial from an environmental point of view:

> ". . . [s]econdary effects, . . . through inducing new facilities and activities, or through changes in natural conditions, may often be even more substantial than the primary effects of the original action itself."

40 C.F.R. § 1500.8(a)(3)(ii). The production of radioactive wastes by virtue of licensing a nuclear power plant is a clear example of such a substantial "secondary" impact. Second, the CEQ has concluded that the interrelated or cumulative environmental impacts of proposed federal actions should be disclosed where there is a significant environmental relationship:

> "The interrelationship and cumulative environmental impacts of the proposed action and other related Federal projects shall be presented in the statement."

40 C.F.R. § 1500.8(a)(i).

As this Court has noted, the procedural obligations of NEPA depend upon the kind of federal action being taken. *SCRAP*, *supra*, 422 U.S. at 322. Here, the immediate proposal, the licensing of one nuclear power plant, actually *creates* a "secondary" environmental problem of coping with its wastes, and absolutely necessitates future *remedial* actions. Unlike the circumstances presented in *Kleppe*, there is no evidentiary issue raised here concerning the existence or scope of a presently planned proposal for action. Unlike highway segmentation cases, or situations where distinct federal actions may have a "joint" or "synergistic" environmental impact, the production of radioactive wastes does not raise an evidentiary question concerning the *independence* of a present proposal for action from the environmental consequences of related actions which are merely contemplated or separated by geographic location.[22] Therefore, the Commission must, "[w]ith appropriate allowances for the inexactness of predictive ventures . . .," describe and analyze the long-term environmental consequences of producing radioactive wastes. *Kleppe*, *supra*, 427 U.S. at 402, n.13.

Both the *Vermont Yankee* Appeal Board, and subsequently the Commission, have acknowledged that serious uncertainties characterize the future environmental management of radioactive wastes. *App.* 126-27, 354-55. The Commission's attempt to evade its NEPA responsibilities on the basis of a claim that environmental consequences are uncertain, if upheld by this Court, would subvert the purposes of the Act. Where a proposal may have severe

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[22] A line of Court of Appeals decisions has also focused upon the distinction between present proposals and other independent actions. *See, e.g., Swain* v. *Brinegar*, 542 F.2d 364 (7th Cir. 1976); *Swain* v. *Brinegar*, 517 F.2d 766 (7th Cir. 1975); *Conservation Society of Southern Vermont* v. *Secretary of Transportation*, 531 F.2d 637 (2d Cir. 1976); *Trout Unlimited* v. *Morton*, 509 F.2d 1276 (9th Cir. 1974); *Scientists Institute for Public Information* v. *AEC*, 481 F.2d 1079, 1093-94 (D.C. Cir. 1973) ["*SIPI*"]; *but see also*, *Sierra Club* v. *Froehlke*, 534 F.2d 1289 (8th Cir. 1976); *Natural Resources Defense Council* v. *Callaway*, 524 F.2d 79 (2d. Cir. 1975); *Natural Resources Defense Council* v. *EPA*, 512 F.2d 1351 (D.C. Cir. 1975); *Minnesota PIRG* v. *Butz*, 498 F.2d 1314 (8th Cir. 1974). None of these cases presented factual circumstances similar to those here because there is no doubt that the scope of the nuclear licensing proposal includes the production of radioactive wastes. There is no independent act or segmented proposal which will create the environmental impact of having to cope with radioactive wastes. The Commission should, perhaps, treat the problem of radioactive wastes generically, due to the cumulative aspects of the long-term management and disposal problems. This determination is not before the Court, and in fact the Commission has chosen to handle the issues generically.

long-range effects, these effects can not be ignored merely because they are of uncertain dimensions. There is no question that the production of radioactive wastes poses a serious known risk of harm to the human environment of unprecedented dimensions. The only uncertainty is whether the wastes can and will be controlled in order to minimize potential adverse consequences at an acceptable economical cost for the thousands of years during which they will remain toxic.

The Commission need not engage in a "crystal ball inquiry." But it must comply with the congressional policy embodied in NEPA which does not permit agencies to commit the nation incrementally to presently unresolved environmental problems, without disclosing the nature of the risks and the costs which will be involved in their resolution. As the Court of Appeals found, the Commission's speculation as to theoretically calculated environmental end results rests solely upon ". . . a blind faith in technological progress." 547 F.2d at 640 n.13; *App.* 37 n.13. NEPA does not allow that course of action. The Commission has an obligation to explore the uncertainties and lack of resolution of environmental problems:

> ". . . Section 102(c)'s [sic] requirement that the agency describe the anticipated environmental effects of proposed action is subject to a rule of reason. The agency need not foresee the unforseeable, but by the same token neither can it avoid drafting an impact statement simply because describing the environmental effects of and alternatives to particular agency action involves some degree of forecasting. And one of the functions of the NEPA statement is to indicate the extent to which environmental effects are essentially unknown. It must be remembered that the basic thrust of an agency's responsibilities under NEPA is to predict the environmental effects of proposed action before the action is taken and those effects fully known . . . [I]mplicit in [the] rule of reason

> is the overriding statutory duty of compliance with impact statement procedures to 'the fullest extent possible.'"

Scientists Institute for Public Information v. *AEC*, 481 F.2d 1079, 1097 (D.C. Cir. 1973) (footnote omitted).[23]

As this Court affirmed in *Kleppe*, environmental statements should be predicated upon some factual base which "could be the subject of the analysis envisioned by the statute for an impact statement." *Kleppe*, *supra* at 401. Here, where the means to achieve projected results will have a substantial economic cost in technology research and implementation and will involve serious risks of harm to the human environment, these facts should be reasonably set forth on the public record. The mandate of the law is quite simple: once an agency undertakes a "proposal for action", it must provide a detailed evaluation of its environmental consequences on the basis of the best information presently available. Disclosure of environmental problems by the Commission after they have been created by its earlier licensing decisions violates

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[23] Also in *SIPI*, the Court of Appeals noted that in certain instances,

> "[B]y the time commercial feasibility of the technology is conclusively demonstrated, and the effects of application of the technology certain, the purposes of NEPA will already have been thwarted. Substantial investments will have been made in the development of the technology and options will have been precluded without consideration of environmental factors. Any statement prepared at such a late date will no doubt be thorough, detailed and accurate, but it will be of little help in ensuring that decisions reflect environmental concerns." 481 F.2d at 1093-94.

UCS submits that deferral of a thorough analysis of the environmental effects of radioactive wastes until disposal technology may or may not be commercially demonstrated would pose the precise problem resolved in *SIPI*. It is the cost of reaching a "conclusive demonstration" of waste disposal technology and the risk that substantial investments will not alleviate environmental problems that deserve the most searching scrutiny.

its duty to avoid ". . . locking the barn door after the horses are stolen." *Lathan* v. *Volpe*, 350 F. Supp. 262, 266 (W.D. Wash. 1972).

II. THE TABLE S-3 RULEMAKING RECORD IS INSUFFICIENT TO COMPLY WITH THE COMMISSION'S LEGAL OBLIGATION TO CONSIDER ALL RELEVANT FACTS CONCERNING RADIOACTIVE WASTE DISPOSAL AND TO STATE A REASONED BASIS FOR ITS CONCLUSIONS

A. Judicial Review of Rulemaking Under NEPA

As a substitute for formally considering the environmental effects of producing radioactive wastes in the *Vermont Yankee* EIS, the Commission analyzed these issues for one and one-half days in the Table S-3 rulemaking proceedings. *App.* 352-400, 538-1339. The Commission acknowledges that its consideration of the environmental effects of radioactive waste production in a rulemaking proceeding pursuant to section 4 of the Administrative Procedure Act ("APA"), 5 U.S.C. § 553 (c), was a suggested "means" of fulfilling its obligations under section 102(2) (c) of NEPA, *App.* 387. By instituting these proceedings, the Commission implicitly admits that radioactive wastes are in fact an important environmental impact of licensing a nuclear power plant. However, the Commission concludes in the rulemaking that the problems of radioactive waste management and disposal are so insignificant that they need not be disclosed to the public pursuant to the requirements of NEPA. *App.* 394-95. According to the Commission, a "full and frank disclosure" of the environmental impact of producing radioactive wastes could be achieved by the inclusion of Table S-3's negligible numerical values in future impact statements.

The plain words of Section 4 of the APA, 5 U.S.C. § 553(c), require an agency to give notice of its proposed actions, to provide an opportunity for interested parties to participate, and to incorporate into adopted rules ". . . a concise general statement of their basis and purpose." 5 U.S.C. § 553(c). The House report clarifies the purpose of the "basis and purpose" section of the Act:

> "The agency must keep a record and analyze and consider all relevant matters presented prior to the issuance of rules. The required statement of the basis and purpose of rules issued should not only relate to the data so presented but with reasonable fullness explain the actual basis and objectives of the rule."

H.R. Rep. No. 1980, 79th Cong., 2d Sess. 25 (1946). This Court has determined that agency actions are "arbitrary and capricious" or "otherwise not in accordance with law" under section 10(e) of the Administrative Procedure Act, 5 U.S.C. § 706(2) (A), when the agency's record does not consider all relevant factors and does not set forth a reasoned basis for the conclusions reached which is consistent with statutory law. *See, e.g., FPC* v. *Transcontinental Pipe Line Corp.*, 423 U.S. 326 (1976); *Bowman Transportation, Inc.* v. *Arkansas-Best Freight System, Inc.*, 419 U.S. 281 (1974); *Gulf States Utilities Co.* v. *FPC*, 411 U.S. 747 (1973); *Camp* v. *Pitts*, 411 U.S. 138 (1973); *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402 (1971); *SEC* v. *Chenery Corp.*, 332 U.S. 194 (1947); *SEC* v. *Chenery Corp.*, 318 U.S. 80 (1943).

The "innovative" use of rulemaking by the Commission to comply with NEPA presents this Court with an issue of first impression. This is the first instance where a federal agency has used a rulemaking proceeding to limit the quality of disclosure of the environmental consequences of its actions. In defining the quality of environmental disclosure necessary, the requirements of NEPA

are similar to the "basis and purpose" section of the Administrative Procedure Act. A reviewing court must insure that an agency reasonably considers the environmental consequences of its actions by means of a good-faith, objective effort, sufficient to disclose relevant environmental problems to decision-makers removed from the precise weighing of the costs and benefits of proposals. *See, e.g., Sierra Club* v. *Morton*, 510 F.2d 813, 819-20 (5th Cir. 1975); *Sierra Club* v. *Froehlke*, 486 F.2d 946, 950-51 (7th Cir. 1973); *Silva* v. *Lynn*, 482 F.2d 1282, 1284-85 (1st Cir. 1973); *Environmental Defense Fund* v. *Corps of Engineers*, 470 F.2d 289, 295-96 (8th Cir. 1972), *cert. denied*, 412 U.S 931 (1973); *Natural Resources Defense Council* v. *Morton*, 458 F.2d 827, 833, 836-38 (D.C. Cir. 1972). The overriding purpose of the Act is the development of a record analyzing environmental risks and costs and incorporating environmental factors into agency decisions "to the fullest extent possible." 42 U.S.C. § 4332; *see, Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F.2d 1109, 1113-15, 1118-19 (D.C. Cir. 1971); *see generally*, S. Rep. No. 91-296, 91st Cong., 1st Sess. 1969).

Accordingly, while the Court must not "substitute its judgment for that of the agency" in reviewing the Commission's record of decision-making, the "inquiry into the facts is to be searching and careful." *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402, 416 (1971). Where the comprehensiveness of disclosure under NEPA is drastically limited by the development of a rule, as is the case here, the record supporting the validity of the rule should be thorough and complete. Implicit in NEPA is a duty to explain why relevant information brought to the attention of an agency by interested parties will not be examined as part of major federal actions. *See, e.g., Committee for Nuclear Responsibility* v. *Seaborg*, 463 F.2d 783, 787-88 (D.C. Cir. 1971). Failure to analyze major issues would defeat

NEPA's goals of achieving "environmental full disclosure" and making "decision-making more responsive and more responsible." *Environmental Defense Fund* v. *Corps of Engineers*, 325 F. Supp. 749, 759 (E.D. Ark. 1971).

NEPA does not permit the Commission to sit back and passively judge adversary contentions. The Commission must "explicate fully its course of inquiry, its analysis and its reasoning." *Ely* v. *Velde*, 451 F.2d 1130, 1139 (4th Cir. 1971). "The role for the court is to insure that the agency has taken a 'hard look' at environmental consequences." The pragmatic process of judicial review of a record supporting environmental decision-making has been clearly summarized by Judge Leventhal:

> "[T]he court must study the record attentively, even the evidence on technical and specialist matters, 'to penetrate to the underlying decisions of the agency, to satisfy itself that the agency has exercised a reasoned discretion with reasons that do not deviate from or ignore the ascertainable legislative intent.' It must ensure that the agency 'has given reasoned discretion to all material facts and issues.' The court exercises this aspect of its supervisory role with particular vigilance if it 'becomes aware, especially from a combination of danger signals that the agency has not really taken a *'hard look'* at the salient problems, and has not genuinely engaged in reasoned decision-making."

Leventhal, *Environmental Decision-making and the Role of the Courts*, 122 U. Pa. L. Rev. 509, 511 (1974), quoting *Greater Boston Television Corp.* v. *FCC*, 444 F.2d 841, 850, 851 (2 quotes) (D.C. Cir. 1970), *cert denied*, 403 U.S. 923 (1971) (footnotes omitted).

B. The Court of Appeals Correctly Found the Rulemaking Record Substantively Deficient on the Issue of High-Level Waste Disposal

The Petitioner, intervenors Baltimore Gas and Electric Co., *et alia*, and the Federal Respondents have argued that the Court of Appeals decision should be reversed because the Court improperly intruded into the discretion of the Commission to select procedures for decision-making. (Brief for Petitioner, Vermont Yankee Nuclear Power Corp. 30-39; Brief for Baltimore Gas and Electric Company, *et al.*, 22-34; Brief for Federal Respondents 36-50.) The Court of Appeals, however, not only expressly disclaimed any intrusion into the Commission's selection of procedures,[24] but also set forth a detailed explanation of the basis for its decision:

> ". . . [*W*]*here apparently significant information has been brought to its attention, or substantial issues or policy or gaps in its reasoning raised, the statement of basis and purpose must indicate why the agency decided the criticisms were invalid.* Boilerplate generalities brushing aside detailed criticism on the basis of agency 'judgment' or 'expertise' avail nothing; what is required is a reasoned response, in which the agency points to particulars in the record which, when coupled with its reservoir of expertise, supports its resolution of the controversy. *An agency may abuse its discretion by proceeding to a decision which the record before it will not sustain, in the sense that it raises fundamental questions for which the agency has adduced no reasoned answers.*"

[24] The Court of Appeals explicitly stated:

> ". . . it is not proper for a reviewing court to prescribe the procedural format which an agency must use to explore a given set of issues. Unless there are statutory directives to the contrary, an agency has discretion to select procedures which it deems best to compile a record illuminating the issues." 547 F.2d 644; *App.* 45 (footnotes omitted).

547 F.2d 633, 646; *App.* 50 (footnotes omitted) (emphasis added).

An issue relating to judicial review of agency procedures is simply not before the Court. The Commission, in its revised rulemaking after the Court of Appeals decision, has utilized only notice and comment procedures to develop an "interim" rule, and will use the procedures originally developed in the Table S-3 hearing to adopt a final rule. 41 *Fed. Reg.* 45849 (Oct. 18, 1976); 42 *Fed. Reg.* 13803 (March 14, 1977); 42 *Fed. Reg.* 26987 (May 26, 1977). It is disingenuous for the Commission to argue that it is hamstrung with procedural burdens, when in fact the Court decision has been interpreted not to mandate any such obligations. Both the Petitioner and the Commission only attempt to dissuade this Court from focusing upon the central ruling of the Court of Appeals which held that the grounds upon which the Commission acted could not sustain its actions as legal. *See, e.g., SEC* v. *Chenery Corp.*, 318 U.S. 80, 94-95 (1943).[25]

[25] The line of informal rulemaking decisions cited by the Court are consistent with the primary focus of judicial review—to ensure the reasoned exercise of administrative discretion. *See, e.g., Ethyl Corp.* v. *EPA*, 541 F.2d 1, 33-37 (D.C. Cir. 1976) (en banc), *cert. denied*, 426 U.S. 941 (1976); *Portland Cement Ass'n* v. *Ruckelshaus*, 486 F.2d 375, 393-95 (D.C. Cir. 1973), *cert. denied*, 417 U.S. 921 (1974); *Mobil Oil Corp.* v. *FPC*, 483 F.2d 1238 (D.C. Cir. 1973); *International Harvester* v. *Ruckelshaus*, 478 F.2d 615, 630-32, 648-49 (D.C. Cir. 1973); *Appalachian Power Co.* v. *EPA*, 477 F.2d 495, 506-07 (4th Cir. 1973); *Walter Holm & Co.* v. *Hardin*, 449 F.2d 1009, 1015-16 (D.C. Cir. 1971); *Greater Boston Television Corp.* v. *FCC*, 444 F.2d 841, 850-51 (D.C. Cir. 1970), *cert. denied*, 403 U.S. 923 (1971); *American Airlines* v. *CAB*, 359 F.2d 624, 629-33 (D.C. Cir. 1966) (en banc), *cert. denied*, 385 U.S. 843 (1966). The opportunity to participate in formal agency decision-making is protected by adherence to "the principle of assuring challengers timely access to the critical reasoning process of the agencies." Williams, *"Hybrid Rulemaking" under the Administrative Procedure Act: A Legal and Empirical Analysis*, 42 U. Chi. L. Rev. 401, 455 (1975). By at least demanding a reasoned response to public critiques, the judiciary

1. *Dr. Pittman's Testimony on High-Level Waste Management and Disposal is Factually Inadequate to Support the Commission's Table S-3 Rule*

The factual basis for the Commission's conclusion that the problems of high-level radioactive waste disposal are negligible was the testimony of one witness, Dr. Frank K. Pittman. *App.* 776-800. In that testimony, Dr. Pittman discussed an allegedly "proven" method of storing radioactive wastes in a "Retrievable Surface Storage Facility." *App.* 777-788. He concluded that this type of facility could be available in the 1980's and could store high-level radioactive wastes for up to 100 years. *App.* 778-779, 1300. But, as the Commission's staff acknowledged, Dr. Pittman's brief presentation was . . . "the first public release of the *preliminary concepts* for the Federal Repository and provides a summary of the cur-

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can effectively require a full consideration of relevant facts and a fair resolution of issues. As Judge Friendly has noted,

> "It is thus not too consequential whether a court invalidates a rule on the ground that the procedures have not developed substantial evidence to support it or even evidence adequate to rebut a claim that it is arbitrary and capricious, or, instead, takes the route of prescribing ad hoc procedural requirements in addition to those of Section 553. . . . There will continue to be cases of rulemaking in which, in order to show that its action is supported by substantial evidence or even to avoid characterization of its actions as 'arbitrary and capricious,' the agency must provide *'some mechanism for interested parties to introduce adverse evidence and criticize evidence introduced by others.'* Just what mechanism must be provided will depend on the interests at stake, the complexity of the issue, and the usefulness of the particular mechanism as weighed against its adverse effects." Friendly, *Some Kind of Hearing*, 123 U. Pa. L. Rev. 1267, 1314 (1975) (footnotes omitted) (emphasis in original).

Here the Commission has failed even to confront the principal environmental issues at stake. Until this effort is made, the issue of the fairness of the procedures used would not be ripe for judicial review.

rent status and potential environmental effects of the high-level waste *interim storage facility. . . .*" 547 F.2d at 647 n.44; *App.* 53 n.44 (emphasis added).

Dr. Pittman also mentioned "other potential concepts" for long-term high-level waste disposal. As the Commission admits, a "Retrievable Surface Storage Facility" would be a temporary measure for use until a long-term high-level waste disposal method was developed. *App.* 1292. Dr. Pittman states that ". . . [t]he major current effort is to bring the beeded salt concept, about which so much is known, to the point of proven acceptability by the construction and operation of a pilot facility. . . ." *App.* 789. He also indicates that other research and development efforts are under way:

> "In addition to the rather extensive program of research, development, testing, design, construction and pilot plant operation underway on the bedded salt concept, the Commission is currently making a thorough evaluation of all other potentially attractive near- and long-term disposal concepts in order to: (1) assure that no feasible concept has been overlooked; and (2) lay the groundwork for future programs, should the work on bedded salt not result in acceptability of that concept for very long-term disposal."

App. 790-91. Without any further explanation of "what is known" about bedded salt, or the environmental risks and research and development costs involved in other "concepts", Dr. Pittman set forth his salient conclusions:

> "(1) the program being followed by the industry under AEC regulation and by the AEC offers assurance that the commercial high-level wastes will be managed safely from its initial production; (2) the surface storage method, to be used by the AEC, is good for as long as adequate human surveillance and maintenance effort is continued; (3) the prob-

> ability that work currently underway will demonstrate the use of bedded salt as a safe, acceptable, ultimate disposal method within the next 10 to 15 years is very high; (4) should bedded salt not prove to be acceptable, other acceptable geologic disposal concepts offer reasonable probability of reaching a point of acceptability within two or three decades; and (5) the waste in initial storage will be easily retievable for either near- or far-term disposal methods when they are developed." *App.* 791.

Dr. Pittman's testimony neither discusses the issues in depth nor considers all relevant factors. His only detailed examination of any high-level waste management technology concerned short-term retrievable storage. But short-term storage is not equatable with long-term disposal. The environmental effects of producing radioactive wastes must be endured for up to 250,000 years. "Short-term" storage could not make those effects negligible or capable of description by reference to a table of numerical values. The present choice of placing radioactive wastes in short-term storage will leave the most severe environmental hazards for resolution by future generations. Further, the government has now abandoned its efforts to develop Retrievable Surface Storage Facilities (RSSF), thus making Dr. Pittman's testimony of radioactive waste disposal irrelevant.[26]

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[26] A draft environmental impact statement was prepared on the RSSF program. *Management of Commercial High Level and Transuranium-Contaminated Radioactive Waste*, AEC WASH-1539 (Sept. 1974). The adequacy of the statement was strongly criticized, and it was subsequently withdrawn. The RSSF concept was abandoned pending a "comprehensive reevaluation of the federal program in this critical and controversial area." Letter of R. Seamans, Administrator of ERDA to the Chairman, Joint Committee on Atomic Energy (April 9, 1975). 547 F.2d at 648 n. 47; *App.* 55 n. 47. When the decision to abandon the development of a RSSF, the Commission made no effort to revise the Environmental Survey or the Table S-3 rule. Apparently, the Commission stands behind the remainder of Dr. Pittman's testimony as a factual predicate for the validity of the rule.

The testimony on a long-term radioactive waste disposal can be described—at best—as vague. No factual or technical basis is set forth to support the conclusion that radioactive wastes will have only the impact upon the human environment stated in Table S-3 over the hundreds of thousands of years of their toxic radioactivity. Dr. Pittman did not even conclude that a method of waste disposal has yet been proven environmentally and economically acceptable. *App.* 789-91. He only concluded that it is "reasonably probable" that one method of waste disposal will "reach a point of acceptability." His prognosis of "reasonable probability" is not supported by any discussion or analysis of what techniques may be used and how the application of these techniques may succeed in permanently isolating radioactive wastes from the human environment.

It is not surprising, given the glibness of Dr. Pittman's assurances, that the possibility of technological failure is blithly cast aside. Dr. Pittman asserted that if the prime long-term isolation method, disposal in bedded salt deposits, does not materialize, other technologies are *"being developed."* *App.* 791. But no explanation of what the phrase "being developed" means or may involve was given. Relevant facts concerning the costs, risks, and uncertainties of developing a satisfactory disposal method were ignored.

The research effort to develop a method of radioactive waste disposal is significantly more complex than Dr. Pittman's testimony indicates. In 1972, Dr. Pittman himself candidly concluded that:

> "While none of the suggested long-term solutions to the problem of permanent disposal of high-level radioactive waste is technically or economically feasible today, the Atomic Energy Commission recognizes that one or more may well offer attractive options in the future. For this reason, the Com-

> mission will continue programs of study, evaluation and experimentation on promising future disposal methods, and will conduct its radioactive waste management program in a way which will not preclude use of such techniques should they become available in the future." [27]

Despite the number of alternatives *potentially* available, the suitability of *any* one means of permanent radioactive waste disposal has not been demonstrated. An actual program of implementing an option that will provide for the protection of the health and safety of the public and the "human environment" is still remote. The current state of the art of radioactive waste disposal remains investigatory and focused upon research and development programs. In citing the findings of a 1975 ERDA Task Force on the "Nuclear Fuel Cycle" (upon which Dr. Pittman served), the Court below succinctly summarized the nature of current problems and uncertainties:

> "The unanimous task force concluded, *inter alia*, 'there are still many technical problems and uncertainties in the overall area of processing of spent fuel and managing its waste', [*Nuclear Fuel Cycle: A Report of the Fuel Cycle Task Force*, ERDA-33 (March 1975)] 40; '[t]he costs of storage and ultimate disposal . . . are very much higher than had previously been assumed . . .', *id.*, 46; '[the public] fear[s] that the radioactive waste generated . . . will either be neglected, and thus place an unacceptable hazard potential on mankind, or be managed in a way that will place an unacceptable burden on future generations to assure continued public safety. [T]hese . . . fears . . . are supported by a fair segment of the scientific community—many of whom

[27] Pittman, F. K., *Management of Commercial High-Level Radioactive Waste* 17 (paper delivered at the Massachusetts Institute of Technology, July 25, 1972).

> otherwise support the use of nuclear reactors for the generation of electric power.' *id.*, 49-50."

547 F.2d at 650 n.51; *App.* 60 n.51.

The underlying uncertainties and problems in the search for a solution to the long-term disposal question were brought clearly to the Commission's attention in the rulemaking proceedings. The history of recent failure to implement the "most promising" disposal technology, salt mine disposal, was discussed by *amicus curiae*. *App.* 894-896, 1072-1107. This history was ignored by Dr. Pittman, and accordingly by the Commission, even though it illustrates the actual status of waste management and disposal techniques. Solutions are clearly not in hand. Gradual progress toward the demonstration of the feasibility of techniques, determined *in unconfirmed theory* to be adequate for the job by various technician experts, is continuing.

The Commission's investigation of a salt mine in Lyons, Kansas to demonstrate high-level waste disposal indicated that radioactive wastes are not a "non-problem." The Commission had "planned" to dispose of wastes in bedded salt deposits as early as 1957, but its first effort to implement heretofore theoretical plans at Lyons proved a dismal failure. After the Kansas Geological Survey raised serious concerns about both the suitability of the site and the sufficiency of the Commission's evidence that salt disposal would prevent radioactive dispersion and seepage in the biosphere, the site was abandoned. Dr. William Hambleton, Director of the Kansas Geological Survey, concluded from his investigation that ". . . the Lyons site is a bit like a piece of Swiss cheese, and the possibility for entrance and circulation of fluids is great." [28] Therefore, a great danger was posed to un-

[28] Hambleton, *The Unsolved Problem of Nuclear Wastes*, Technology Review, March/April 1972 at 15-19. Dr. Hambleton's views were read into the record. *App.* 895-96.

derlying aquifers feeding into drinking water supplies. The site lacked the geological characteristics necessary to provide a stable undisturbed disposal site for time periods up to hundreds of thousands of years. Dr. Hambleton concluded that ". . . [a]s to the general concept of burial of nuclear wastes in salt, the jury is still out." [29] *See, App.* 894-896.

The lack of a clear-cut solution to the disposal problem is further illustrated by the ongoing investigation of other alternative possibilities. In May 1976, the Energy Research and Development Administration ("ERDA") published a comprehensive survey of alternative technologies for long-term waste disposal, *Alternatives for Managing Wastes from Reactors and Post-Fission Operations in the LWR Fuel Cycle*, ERDA 76-43 (May 1976) (hereinafter cited as "ERDA Alternatives" study). That report, specifically designed *not* to be an environmental assessment or impact statement, sets forth the possible technological options for the resolution of radioactive waste problems. Significantly, the theoretically plausible solutions for long-term isolation of high-level waste proposed in the "ERDA Alternatives" study parallel the options which UCS requested the Commission to consider in its rulemaking. *App.* 1072-1107. Current ERDA plans include an investigation of a number of these options at potential sites in over thirty-five states.[30] Neither of these options nor existing ERDA plans were evaluated by the Commission in order to reach its conclusions that radioactive wastes would have an insignificant impact on the environment. However, not only is the probable success or failure of these plans critical in evaluating the environmental effects of radioactive wastes, but the plans themselves, and the need for such plans, are an impact of the production of wastes. The environmental and economic costs of long-term radioactive waste isolation are multiple, reflecting present risks and costs of the actual development efforts now in progress.

[29] *Id.*

[30] ERDA Public Release No. 76-355 (Dec. 2, 1976).

The failure of Dr. Pittman and the Commission to examine research and development programs and choices ignores broad environmental concerns within the purview of NEPA. One technical commentator has pointed out that a pursuit of diverse disposal site options and irreversible, permanent disposal technologies is imperative in order to protect future generations from the impact of our decisions and to balance short term needs against long-term comments:

> "[A]s our every act has the potential to profoundly alter future lives, our minimum ethical obligation is to examine most thoroughly the potential consequences of present actions, to acknowledge them openly, and to minimize the potential for irremedial harm.
>
> "This obligation would not be satisfied if, in the disposal of nuclear wastes, we imposed upon future societies an obligation to provide for a stability of institutions unprecedented in history, if we attempted to transfer the responsibility for accidents from our shoulders to theirs. There is no ethical or moral basis for placing social and technical requirements and obligations on future generations for the sole purpose of protecting them from the consequences of present activities and decisions. The obligation to consider the effects of errors in technology or judgment, to provide for our inability to guarantee future technical performance, social stability, and cultural continuity rests with the present."

Rochlin, *Nuclear Waste Disposal: Two Social Criteria*, *Science* Vol. 195 No. 4273 at 29 (Jan. 7, 1977).

In addition to purely technical issues, the concerns expressed by Dr. Rochlin deserve disclosure in the record.

Section 102(2)(c)(iv) of the NEPA, 42 U.S.C. § 4332(2)(c)(iv), specifically requires the Commission to analyze the relationships between short-term and long-term uses of the environment. The congressional declaration of policy in section 101(a) of NEPA, 42 U.S.C. § 4331(a), establishes a complementary commitment to ". . . fulfill the social, economic, and other requirements of present and future generations." The Senate Report states that NEPA is ". . . designed to deal with the long-range implications of many of the critical environmental problems which have caused great public concern. . . ." S. Rep. No. 91-296, 91st Cong., 2d Sess. 8 (1969). The quality of future risks created by radioactive materials alone has led some members of the scientific community to question the acceptability of large-scale power reactors where other energy production options exist:

> "I believe that the vigorous pursuit of [energy] alternatives is far preferable to the *risk of irreversible contemination* of the environment that may well result from an economy heavily dependent upon plutonium and on the other actinides that would accompany it." (Emphasis added.)

J. T. Edsall, *Toxicity of Plutonium and Some Other Actinides* in *Bulletin of Atomic Scientists* 37 (Sept. 1976).

Without a readily available means of resolving the long-term environmental problem created, a failure even to recognize the character of the potential future impact of present actions does not comply with the law. Vague assumptions will not fulfill the Commission's responsibility to make sound environmental choices which could "leave to countless future generations a permanent heritage of radioactive waste products" and their dangers.[31]

[31] In 1975, the National Council of Churches of Christ of the U.S.A. assembled a number of prominent scientists and scholars, led by René Dubos and Margaret Mead, to endorse a "Statement of Concern" about the risks of plutonium and its possible use as a reactor fuel. The background report to this statement noted,

> "There is as yet no high-level waste storage site. There is not even a credible proposal for such a storage site. This is particularly disturbing since the existence and severity of the waste storage problem has been known since the first days of the nuclear age and there has been thirty years of study and policy review. . . . The hope associated with the 'interim' storage proposals was apparently that future generations would be able to resolve a problem that this generation is finding insoluble. ERDA is now trying again to find the permanent storage site and in the meantime more waste is being generated." *The Plutonium Economy: A Statement of Concern* 16-17 (National Council of Cnurches of Christ in the U.S.A., Sept. 1975).

The final statement concluded:

> "There is additionally the fundamental ethical question of our right to leave to countless future generations a permanent heritage of radioactive waste products. In producing vast quantities of materials so deadly that they will require perpetual vigilance and guardianship, nuclear power will inject into the future an element of risk comparable to that of our vast store of nuclear arms.
>
> "These profound biological and social hazards, many without present technical solutions, or easily foreseeable solution, would be incurred in pursuit of small and possibly ephemeral economic advantages. Decisions balancing the risks of the plutonium economy with its benefits are now founded on self-serving economic and technical assessments lacking in analytical quality. They are being hastily made without the full and informed public discussion that decisions of such unique importance require." *Id.* at vi.

[32] The societal problems created by the existence of radioactive wastes include risks of sabotage and terrorism as well as the need for long-term stable management systems capable of identifying and solving problems of safeguarding repositories, correcting technical failures or stopping slow radioactive leakage. *See, App.* 903-910. A recent survey of managerial options submitted to ERDA concluded, *inter alia*, that: "[e]xisting institutional arrangements

Under these circumstances, NEPA requires a thorough examination of health and safety hazards and institutional and social commitments which may be passed on as a legacy of present decisions.[32]

2. *The Commission Provided No Reasoned Explanation for Excluding Relevant Considerations and For Concluding That Environmental Effects Are Negligible*

The grounds relied upon by the Commission to sustain its conclusion that the environmental impact of implementing a means of long-term radioactive waste disposal is negligible are essentially an intuitive leap forward to a future technological system which will resolve all foreseeable problems without risk or cost. Dr. Pittman's testimony does not develop facts or evidence which could support any other determination. However, the Administrative Procedure Act requires more than intuitive guesswork. To enforce the requirement of reasoned support of an agency rule in the record, this Court has demanded that ". . . the agency's path may reasonably be discerned." *Bowman Transportation, Inc.* v. *Arkansas Best-Freight System, Inc.*, 419 U.S. 281, 286 (1974), *citing, Colorado Interstate Gas Co.* v. *FPC*, 324 U.S. 581, 595 (1945). Some rational connection between the factual issues treated by the Commission and the conclusions drawn must be stated. (See cases cited in the text at page 43, and at note 25, *supra.*)

The lack of a reasoned basis for the Commission's rulemaking decision is initially evident from the conflict between the notice of proposed rulemaking (*App.* 352-360) and the statement of basis and purpose (*App.* 385-400). The Commission's notice of proposed rulemaking admits that a "full and frank disclosure and consideration of costs and benefits" (*App.* 355) should be made for proposed licensing of nuclear power plants. In that notice, the Commission states that the results of the application

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for management and regulation of radioactive waste are inadequate for the future." Willrich, et al., *Radioactive Waste Management and Regulation* (Report to ERDA from the M.I.T. Energy Laboratory, 1976).

of this principle to the issues of radioactive waste control "are not entirely clear". *App.* 355. The "fractional contribution" of one reactor is difficult, if not "impossible to ascertain with any degree of certainty". *App.* 355. But the public was advised that ". . . an informed consideration of the *generic questions* of the *environmental impact* associated with the uranium fuel cycle" would be undertaken. *App.* 355 (emphasis added).

Unfortunately, the Commission did not follow through with this reasoning. Rather than confronting the issues on a generic basis, the Commission developed a table of numerical values representing that "impossible to ascertain" fractional contribution of one nuclear power reactor's radioactive wastes to the environment. The purpose of the rulemaking was recast in the statement of basis and purpose accordingly:

> ". . . to provide a *data base from which numerical values could be derived* which would reflect the environmental impact associated with the uranium fuel cycle. . . [t]hese values would then be factored into cost-benefit analyses for individual reactors . . . the Environmental Survey is not an impact statement." *App.* 397 (emphasis added).

When faced with fundamental objections to a rule reducing to *certain* numerical values the acknowledged uncertainties and complexities of unresolved generic problems, such as high-level waste disposal, the Commission did not provide a reasoned response. Known uncertainities, the history of past failures to develop technologies predicted to achieve environmental protection goals, presently created long-term health risks and other factors were glossed over solely on the basis of Dr. Pittman's testimony. The Commission has cast aside these factors, because an "adequate data base" allegedly was presented in its survey. *App.* 392. Since none of the issues UCS raised were dealt with in that "data base",

the dialogue between participants in the rulemaking and the Commission was essentially a sham. The Commission apparently engaged in no probing of the record and provided no rationale for its final decision. An agency does not exercise "objective good faith" when it not only fails to seek out responsible scientific opinion concerning adverse environmental consequences (*Committee for Nuclear Responsibility* v. *Seaborg*, 463 F.2d 783, 787 (D.C. Cir. 1971), but does not even respond to those views when presented. *See also, Portland Cement Ass'n* v. *Ruckelshaus*, 486 F.2d 375, 393-94 (D.C. Cir. 1973), *cert. denied*, 417 U.S. 921 (1974).

The deficiencies of the Commission's reasoning are also clear from its responses provided to the questions raised in the "Report to the Commission by the Nuclear Fuel Cycle Hearing Board." *App.* 364-384. The Hearing Board cited very specific criticisms exposing significant issues raised in the record which should be addressed by the Commission prior to the promulgation of the rule. Those issues included: (1) ". . . the unreliab[ility of the Survey] in that it dealt with nonexistent [waste disposal] facilities. . ."; *App.* 372; (2) the lack of a ". . . full opportunity to explore and comment on the bases for the conclusions in the Survey and, hence, its substance. . ." (*id.*), especially in view of the intent ". . . to issue a substantially revised Environmental Survey", *id.*; (3) ". . . the use in the Survey of qualitatively styled and allegedly undefined descriptive phrases as a basis for conclusions regarding the magnitude of the environmental impact . . . [which] hindered full and inclusive examination of the bases for the salient conclusions. . ." *App.* 373; and (4) the possible ". . . advocacy of substitute "Alternatives" with a radically different approach. . .", *App.* 375.[38]

[38] The Commission's notice of rulemaking indicated that only two alternative means of complying with NEPA would be considered. Either radioactive waste management and disposal would be excluded totally from environmental review or the issues would be reduced to a table of numerical values. *App.* 355-57. Despite the facts brought to the Commission's attention about the uncertainties involved in future waste disposal plans, no broader alternative means of complying with NEPA were contemplated. The basic design and intent of the rulemaking was to affirm a pre-established result. The Commission did not make a reasoned choice among available alternatives upon a consideration of relevant issues. *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402 (1971); *Pillai* v. *CAB*, 485 F.2d 1018, 1029-30 (D.C. Cir. 1973).

The Commission's final "statement of basis and purpose" does not confront any of these questions. First, the Commission acknowledges the argument that the Survey is unreliable and inadequate because high-level waste *disposal* facilities are non-existent. *App.* 390. The reasoning provided for the decision to dismiss this issue is that ". . . [c]onsiderable information was presented at the hearing on high-level waste *storage*, utilizing a retrievable surface storage facility". *App.* 391 (emphasis added). Yet "storage" is not the same as "disposal", and the production of radioactive wastes creates the need for long-term disposal and its environmental impacts. Dr. Pittman's only reflection on the existence of scientific opinion that the disposal problem is unresolved was to label such dissent as "unwarranted fear" and a "bugaboo". *App.* 778.

But the present reality of the state of waste disposal technology is not, by any means, an unwarranted fear or a *de minimus* environmental consequence of licensing a nuclear power plant. Over 2500 members of the scientific and technical community agreed with *amicus curiae* in a 1975 petition that the production of radioactive wastes creates such substantial long-term environmental risks, which can not be eliminated adequately with existing technologies, that Congress should delay the licensing of nuclear power plants until more prudent solutions to the problem are developed. (See text at note 3, *supra*.) Even if the Commission does not agree with

these views, it has a duty to acknowledge them, and explain its differences with the reasoning supporting them, rather than labelling such dissent a "bugaboo."

The Commission further reasons that although ". . . a waste storage facility has not been constructed. . .," all environmental impacts are known because ". . . preliminary conceptual designs have been developed using existing technology based on well established data and techniques". *App.* 392. The difference between "preliminary conceptual designs" and constructed facilities is obvious. The Commission confuses the predicted environmental impacts of design, with those of implementation and actual performance.[34] Reasoning based upon conceptualization ignores the costs necessary to develop technology from drawingboard concepts to actual application. It also ignores the fact that concepts may be abandoned, as is the case with Retrievable Surface Storage Facilities, while the long-term disposal problem remains.

At a bare minimum, the Commission should have disclosed relevant technology development and implementation, strategies used to justify its conclusion defining risks, costs and environmental implications in order to produce an adequate record. Numerous decisions have

[34] This point was brought to the Commission's attention in the rulemaking:

> "One of the most important factors that we think is lacking in this report is the failure to distinguish between design objective on the one hand and performance on the other. The history of the Atomic Energy Commission and atomic energy in general has been one in which design has rarely been achieved and that performance has represented a significantly different figure."

App. 840. The Commission provided no response to this argument and gave no reasoned explanation for its lack of any analysis of the costs and risks of achieving actual performance of predicted technologies. Despite the use of "conservative" estimates, the Commission carefully avoided making its "estimates" even minimal performance standards or future operating limits. *App.* 396.

found this type of information essential for a reasoned judgment based upon a complete record. For instance, in *Scientists Institute for Public Information* v. *AEC*, 481 F.2d 1079 (D.C. Cir. 1973), the Court of Appeals held NEPA to be directly applicable to the technology development process. "Meaningful consideration and balancing of environmental costs" could not wait until "the ultimate application of the technology." *Id.* at 1089. In *Natural Resources Defense Council* v. *Grant*, 355 F. Supp. 280 (E.D.N.C. 1973), the Court found that where uncertainty, the need for future research and development, and unresolved environmental issues exist, an agency must consider the "deferral" of the proposal as a reasonable alternative pursuant to sections 102(2)(C)(iii) and 102(2)(E) of NEPA. *See also, Sierra Club* v. *Morton*, 510 F.2d 813, 825-26 (5th Cir. 1975). The Court in *Grant* also found that the history of success and failure of similar projects should be discussed on the record. *Natural Resources Defense Council* v. *Grant*, 355 F. Supp. 280, 288 (E.D.N.C. 1973). In *Environmental Defense Fund* v. *Hardin*, 325 F. Supp. 1401 (D. D.C. 1971), an adequate research program was considered mandatory under NEPA prior to agency action. In *Portland Cement Ass'n* v. *Ruckelshaus*, 486 F.2d 375 (D.C. Cir. 1973), *cert. denied*, 417 U.S. 921 (1974) the Court stated that ". . . [i]t is not consonant with the purposes of a rulemaking proceeding to promulgate rules on the basis of inadequate data, or on data that, to a critical degree is known only to the agency." *Id.* at 393.[35]

[35] The Commission has not even met its minimal obligation to disclose the studies and technical data upon which it could rely upon in order to assert that long-term disposal is technically feasible. NEPA requires this type of disclosure. A final EIS can be neither "too vague, too general and too conclusory," *Environmental Defense Fund* v. *Froehlke*, 473 F.2d 346, 348 (8th Cir. 1972), nor "unsupported by empirical or experimental data, scientific authorities or explanatory information of any kind." *Natural Resources Defense Council* v. *Grant*, 355 F. Supp. 280, 287 (E.D.N.C. 1973).

The further critique by the Hearing Board (*App.* 373) of the "undefined descriptive phrases" supporting the salient conclusions on waste disposal is also blandly dismissed by the Commission. The Commission does not elaborate the basis for the rule, but only suggests a possible expansion of the range of numerical values which could be presented. *App.* 393. The assumption that numerical values themselves are adequate is never questioned by the Commission in light of the record:

> "The Commission believes that providing ranges of variables relevant to assessing environmental impact would serve little or no constructive purpose here since conservatism was utilized in deriving the Summary Table values, and thus, these values already reflect an environmental impact greater than that which is truly anticipated."

App. 393. Unfortunately the Commission misses the point of the Hearing Board's questions based upon the objections in the record. In view of the record, the Hearing Board asked not only whether a range of variables should be presented, but also whether ". . . more extensive analyses of the long-term environmental effects of, among others, waste storage and/or disposal are required to sustain the validity of the conclusions reached . . ." *App.* 374. This latter question raises the essential problem which concerns the rational basis for the disclosure of only predictive numbers concerning the impacts of undeveloped and, in the case of high-level waste disposal, unknown technologies. In short, what foresight enabled the Commission to draw "conservative" numerical conclusions?

The Commission dismisses the need to examine alternative waste disposal technologies itemized in UCS's comments (*App.* 1084-1098), and characterized by Dr. Pittman as under investigation (App. 777), because "conservatism was utilized" whenever it was not possible "to

produce numerical values reflecting real or actual environmental impact" *App.* 397. Conservatism, whatever it may mean as a system of reasoning, is used here as a system of making empirical judgments without a record of factual evidence. The promulgated rule is based on a method of "crystal ball" prophecy of future numerical values, and can not be sustained on the administrative record. *See, International Harvester* v. *Ruckelshaus*, 478 F.2d 615, 629 (D.C. Cir. 1973); *Environmental Defense Fund* v. *Ruckelshaus*, 439 F.2d 584, 597 (D.C. Cir. 1971).

Finally, the circumstances clearly are not analogous to the situation in *Carolina Environmental Study Group* v. *United States*, 510 F.2d 796 (D.C. Cir. 1975). In that case, the Commission provided very little detail in an EIS concerning the consequences of the most severe class of postulated nuclear power plant accidents. The Commission had previously conducted extensive and complex risk assessment studies based on existing technology which concluded that this class of accident was exceedingly unlikely. *Id.* at 799-800. In contrast, the only "unlikelihood" associated with long-term radioactive waste disposal is the capacity and availability of technology to protect the environment from severe consequences. A risk assessment study has not been made by the Commission. In reviewing future technology development, no attempt has been made by the Commission to "accept certain areas of uncertainty" or to "assess or characterize the strengths and weaknesses of opposing arguments" in any meaningful way. *See, Ethyl Corp.* v. *EPA*, 541 F.2d 1, 23-27 (D.C. Cir. 1976) (en banc), *cert. denied*, 426 U.S. 941 (1976); *Reserve Mining Co.* v. *EPA*, 514 F.2d 492, 507 n.20 (8th Cir. 1975) (en banc); *Amoco Oil Co.* v. *EPA*, 501 F.2d 722, 741-42 (D.C. Cir. 1974), *cert. denied*, 417 U.S. 921 (1974).

If allowed to stand by this Court, the Commission's action would amount to a conclusion of law that even the

most serious environmental consequences of agency action need not be recognized, disclosed or evaluated in detail because a single expert believes that these consequences can be handled at some uncertain geographic location, in some uncertain manner, at some unknown cost, by some technical means which may or may not be suited for the task.

III. EXPERT JUDGMENTS WITHIN AGENCY DISCRETION WILL NOT BE DISTURBED BY A JUDICIAL REMAND WHICH REQUIRES A FAIR DISCLOSURE OF ENVIRONMENTAL PROBLEMS UNDER NEPA

A. Introduction

The Commission's reduction of all foreseeable environmental effects of the production of radioactive wastes to a vague statement in the *Vermont Yankee* EIS and an insignificant series of numerical values in the Table S-3 rule raises highly technical and complex matters for judicial scrutiny. But, as this Court has stated:

> "Reviewing Courts are not obliged to stand aside and rubberstamp their affirmance of administrative decisions that they deem inconsistent with a statutory mandate or that frustrate the Congressional policy underlying a statute. Such review is always properly within the judicial province, and courts would abdicate their responsibility if they did not fully review such administrative decisions."

National Labor Relations Board v. *Brown*, 380 U.S. 278, 291-92 (1965). The mere technical complexity of the issues can not preclude a probing judicial scrutiny of the consistency between allegedly "expert" judgments made by the Commission and the legislative intent underlying NEPA. As Professor Jaffe has noted:

> "The respective fields of agency and court cannot be marked off in terms of their comparative competence to deal exclusively, one with a certain class of questions, the other with another class. We have seen that administrative decisions do not lend themselves to a classification of "purely" expert, partially expert, and not-at-all expert. The expert may make judgments which are highly relevant to a determination of validity. *But ultimately the court is asked to answer and must answer the question: does the action comport with the purposes and meaning of the statute as the court sees it?* This inquiry cannot, or at least should not, be evaded by an appeal to the presence or potential presence of technical considerations."

L. Jaffe, *Judicial Control of Administrative Action* 584 (1965) (emphasis added). Judicial remand of the Commission's treatment of radioactive waste management and disposal issues should demand compliance with the two basic standards of NEPA: "full disclosure" and "appropriate consideration" of environmental problems.

The legislative goals of NEPA are not to allow agencies to make closed-door expert judgments concerning their subjective attitude toward environmental problems. Rather, NEPA requires that the nature of environmental implications of federal actions be fully explained consistently with the action-forcing positions of the law. This mandate includes a requirement to present dissenting views and sufficient reasoning why environmental effects are outweighed by other considerations of national policy. This process of objectively evaluating environmental problems caused by proposals for action is thus,

> "to ensure that each agency decision-maker has before him and takes into proper account all possible approaches to a particular project (including total abandonment of the project) which would alter the environmental impact and the cost-benefit balance. Only in that fashion is it likely that the most intelligent, optimally beneficial decision will ultimately

be made. Moreover, by compelling a formal 'detailed statement" and a description of alternatives, NEPA provides evidence that the mandated decision-making process has in fact taken place and, most importantly, allows those removed from the initial process to evaluate and balance the factors on their own." *Calvert Cliffs Coordinating Committee* v. *AEC*, 449 F.2d 1109, 1114 (D.C. Cir. 1971).

* * * *

"NEPA assumes as inevitable an institutional bias within an agency proposing a project and erects the procedural requirements of § 102 to insure that 'there is no way [the decision-maker] can fail to note the facts and understand the very serious arguments advanced . . . if he carefully reviews the entire environmental impact statement.'" *Environmental Defense Fund* v. *Corps of Engineers*, 470 F.2d 289, 295 (8th Cir. 1972) (footnotes omitted).

Here, the basic design and intent of the Commission's reduction of environmental concerns to numerical values is totally contrary to the standards of full disclosure and appropriate consideration. The Commission's action must therefore be remanded under the APA as both "arbitrary and capricious" and "without observance of procedure" required by NEPA. 5 U.S.C. § 706(2)(A) and (D).

B. The Commission's Table S-3 Rule Defeats the Full Disclosure Purpose of NEPA

Within the procedural standard set forth in section 102(2)(C) of NEPA, the Commission has a great degree of flexibility to implement the "action-forcing" mandate in a meaningful and effective manner relative to specific generic issues raised by nuclear power plant licensing, such as radioactive waste production. *See generally, Note, The Use of Generic Rulemaking To Resolve Environmental Issues In Nuclear Power Plant Licensing*, 61 Va. L. Rev. 869 (1975). Certainly there is much

to be gained by a generic analysis of significant environmental issues applicable to all nuclear power plants in a similar manner, and having substantial cumulative effects requiring a uniform commitment of resources. *See, Union of Concerned Scientists* v. *AEC*, 499 F.2d 1069 (D.C. Cir. 1974); *Ecology Action* v. *AEC*, 492 F.2d 998, 1002 (2d Cir. 1974) (Friendly, J.).

However, the use of generic procedures can not conflict with the meaningful disclosure and fair assessment of environmental issues contemplated by the "action-forcing" impact statement procedures of section 102(2)(C). As one Court of Appeals has noted, it must be recognized, ". . . on one hand that [NEPA] mandates that no agency limit its environmental activity by the use of an artificial framework and on the other hand that the act does not intend to impose an impossible standard on the agency." *Environmental Defense Fund* v. *Corps of Engineers*, 492 F.2d 1123, 1131 (5th Cir. 1974).

The difficulty with the Commission's framework of decision-making is that any form of oversight by Congress or the public is precluded. 547 F.2d 651; *App.* 62. Rather than generating a full record of possible future environmental consequences, the Commission has hidden behind an arrogant failure to respond to critiques to its conclusory assumptions. The Commission proposes a rule that it is incomprehensible even to an informed, technically trained observer. It neither alerts the public to foreseeable environmental crises, nor explains why the Commission views these crises to be manageable. In short, the means whereby "Table S-3", reprinted in individual power plant impact statements, will provide ". . . a systematic feedback to Congress and the public on the environmental costs of implementing programs . . ." (*App.* 38 n.15) remain unknown. The only material concerning the environmental impact of radioactive wastes which will be circulated to the Congress, the

President's Council on Environmental Quality, state and local government, other interested federal agencies and the public will be "Table S-3" reprinted as one page of each individual nuclear power plant impact statement. The generic discussion, as limited as it was, will be hidden away in the files of the Nuclear Regulatory Commission, not subject to public scrutiny and incorporation into the decision-making process through the procedures required by NEPA.

The issuance of an "environmental survey" by the Commission in the place of the "detailed statement" required by section 102(2)(C) has been rejected once previously. *Scientists Institute for Public Information* v. *AEC*, 481 F.2d 1079, 1084-94 (D.C. Cir. 1973). In *SIPI* it was unequivocally stated that the procedural requirements of section 102(2)(C) are:

> ". . . not indispensible technicalities, but crucial if the statement is to serve its dual functions of informing Congress, the President, other concerned agencies and the public of the environmental effects of agency action, and of ensuring meaningful consideration of environmental factors at all stages of agency decision-making."

Scientists Institute for Public Information v. *AEC*, 481 F.2d 1079, 1091 (D.C. Cir. 1973) (footnotes omitted). Here, the Commission is again not only content to avoid discussion of the environmental consequences of its actions by circumventing the explicit procedures of section 102(2)(C), but it also concludes that generic analysis can reduce the disclosure of controversial environmental problems beyond any form of rational comprehension.[36]

[36] Once the Commission chooses to proceed by generic consideration of environmental issues, *amicus curiae* suggests that it either must prepare a generic impact statement or conduct a rulemaking proceeding in order to determine the quality of information which should be included in individual impact statements accompanying each "major federal action." If the latter course of action is taken, the result reached in the rulemaking must be included in individual impact statements which would be circulated to interested federal agencies, the public, state and local officials, *et cetera*, for comment. *See*, 10 C.F.R. §§ 51.24, 51.50; 40 C.F.R. §§ 1500.3, 1500.7, 1500.9-1500.11. Further, the result reached in rulemaking must be rationally consistent with the full disclosure mandate of NEPA. A rule so developed must be based upon an adequate record and must inform those who read impact statements of all relevant environmental factors and the reasoning supporting the Commission's analysis of those factors. E.g., *Silva* v. *Lynn*, 482 F.2d 1282, 1285 (1st Cir. 1973); *Sierra Club* v. *Morton*, 510 F.2d 813, 819-20 (5th Cir. 1975).

Congress itself is vitally concerned with the information generated by agency compliance with NEPA. In fact, the appropriate body of government to reach a conclusion of law that radioactive wastes are environmentally acceptable is not the Commission, but Congress. National programs can be reworked through the legislative process after agencies have applied their expertise to achieve full disclosure of environmental effects. As the Senate Report accompanying NEPA notes:

> "Many older operating agencies of the Federal Government, for example, do not at present have a mandate within the body of their enabling laws to allow them to give adequate attention to environmental values. In other agencies, especially when the expenditure of funds is involved, an official's latitude to deviate from narrow policies or the "most economical alternative" to achieve an environmental goal may be strictly circumscribed by congressional authorizations which have overlooked existing or potential environmental problems or the limitations of agency procedures. There is also reason for serious concern over the activities of those agencies which do not feel they have sufficient authority to undertake needed research and action to enhance, preserve, and maintain the qualitative side of the environment in connection with development activities."

S. Rep. No. 91-296, 91st Cong., 1st Sess. 14 (1969). The Commission's "artificial framework" of decision-making, cast in the mystique of technical expertise, sweeps known environmental consequences under the rug, rather than ensuring that Congress fully scrutinizes them. *Silva* v. *Lynn*, 482 F.2d 1282, 1285 (1st Cir. 1973).[87]

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[87] Petitioner's argument that Congress has already waived the application of NEPA to the production of radioactive wastes by nuclear power plants (Petitioner's Brief 46-51) is totally unwarranted. The Energy Reorganization Act of 1974, 42 U.S.C. §§ 5801 *et seq.*, §§ 5841 *et seq.*, was enacted ". . . to separate the regulatory functions of the Atomic Energy Commission from its developmental and promotional functions. . ." (S. Rep. No. 93-980, 1974 U.S. Code & Cong. News 5483 (1974), not tacitly to approve of a broad NEPA exemption. Further, the application of NEPA to the issue of radioactive wastes by the Commission will not inevitably bring the nuclear industry to a halt. NEPA does not demand that the Commission reach particular substantive results. But NEPA does "direct[] all agencies to assure consideration of the environmental impact of their actions in decision-making." 115 *Cong. Rec.* 40416 (1969) (remark of Senator Jackson). In *Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F.2d 1109 (D.C. Cir. 1971), NEPA's mandate to consider environmental issues along with other statutory concerns was made clear:

> "NEPA . . . makes environmental protection a part of the mandate of every federal agency and department. The Atomic Energy Commission, for example, had continually asserted, prior to NEPA, that it had the statutory authority to concern itself with the adverse environmental effects of its actions. Now, however, its hands are no longer tied. It is not only permitted, but compelled, to take environmental values into account. Perhaps the greatest importance of NEPA is to require the Atomic Energy Commission and other agencies to *consider* environmental issues just as they consider other matters within their mandate."

449 F.2d at 1112.

After federal agencies have reached decisions based upon a complete record disclosing the environmental impacts of their decisions, Congress, of course, could reconsider the balance struck by the agency. The purpose of NEPA is in part to ensure that information concerning the most serious issues of national environmental policy are brought to congressional attention.

C. The Methodologies Used by the Commission to Develop Table S-3 Do Not Give Appropriate Consideration to the Full Impact of Producing Radioactive Wastes

The Commission limits the discussion of radioactive wastes by use of two methodologies in the rulemaking proceeding: (1) the development of a series of values for a cost-benefit analysis; and (2) the prediction of future effects limited only to those numerical values. These methodologies reduce environmental issues beyond recognition, instead of providing a means for "appropriate consideration" of environmental values. The purpose of the Commission's rulemaking methodologies was not to describe environmental impacts, but to develop a "data base" for the adoption of a regulation limiting disclosure to values in a fully qualified "cost-benefit analysis." *App.* 386, 392. The reliance upon cost-benefit analysis as the sole means of disclosing environmental impacts hardly signifies in and of itself that environmental matters are considered "to the fullest extent possible" in an impact statement. 42 U.S.C. § 4332. Quantification of environmental values in a cost-benefit analysis is by no means the shibboleth of meaningful environmental assessments under NEPA. Compare *Environmental Defense Fund* v. *Corps of Engineers*, 492 F.2d 1123 (5th Cir. 1974), with *Environmental Defense Fund* v. *Armstrong*, 487 F.2d 814 (9th Cir. 1973), *cert. denied*, 416 U.S. 974 (1974); *see generally, Note, Cost-Benefit Analysis in the Courts: Judicial Review Under NEPA*, 9 Georgia L. Rev. 417 (1975).

The National Environmental Policy Act specifically requires that the Commission shall:

> "identify and develop methods and procedures . . . which will insure that *presently unquantified environmental amenities and values may be given appro-*

priate consideration in decision-making along with economic and technical considerations;"

42 U.S.C. § 4332(2)(B) (emphasis added). By adopting this language, Congress concluded that environmental amenities may be unquantifiable at the present time, and an effort to define them in purely "quantified" or numerical figures may not result in "appropriate consideration". The Senate Report accompanying NEPA specifically designated this section to require the development of methodologies for full consideration of environmental factors:

> "In the past, environmental factors have frequently been ignored and omitted from consideration in the early states of planning because of the difficulty of evaluating them in comparison with economic and technical factors. As a result, unless the results of planning are *radically revised at the policy level*—and this often means the Congress—environmental enhancement opportunities may be foregone and unnecessary degradation incurred. A vital requisite of environmental management is the development of adequate methodology for *evaluating the full environmental impacts and the full costs* of Federal actions."

S. Rep. No. 91-296, 91st Cong., 1st Sess. 20 (1969) (emphasis added).

The Commission's exclusive reliance upon its quantified cost-benefit analysis does not disclose the full impact produced by radioactive wastes. Quantification of the environmental effects of radioactive wastes only in terms of theoretical end result effluents not only treats these environmental issues in an impermissibly limited matter, but also precludes consideration of the costs and impacts involved in the process of reaching or failing to reach projected results. Numerical values disclose very little about the risks and costs of the long-term environmental

problems engendered by the production of radioactive wastes. Even if quantified values were significant, the Commission has neglected even to quantify the most readily quantifitable value—the economic costs of environmental protection from radioactive wastes.

The Commission's complementary methodology, allowing it to derive its values, is the art of numerical predictions. Future predictions, supported solely on the basis of alleged "expertise" and "conservatism", are also inconsistent with the basic premises of NEPA. The mandate of section 102(2)(C) of the Act is not to prophecize the unknown, but to make a detailed accounting of the actual *present* impacts, possible adverse consequences, the "relationship between *local short-term uses* of man's environment and the maintenance and enhancement of long-term productivity and "*irreversible and irretrievable commitments of resources*" of specific actions. 42 U.S. 4332(2)(c)(i), (ii), (iv), (v) (emphasis added). Mere predictions of numbers representing the end results of underdeveloped and unknown actions necessary to reduce present risks of environmental contamination and forestall a future crisis hardly inform the public or Congress what irreversible costs and risks can be expected as necessary in order to achieve the goals of environmental preservation.

Predictions and quantifications must be subject to the restraint of reasonableness. *International Harvester* v. *Ruckelshaus*, 478 F.2d 615, 629 (D.C. Cir. 1973). Rather than reflecting a reasoned basis, the Commission's chosen methodologies for complying with NEPA rests upon unexplained assumptions about technological progress and undeveloped means of environmental protection. Even though grave doubts that the reliability of these assumptions were brought to the Commission's attention (see pages 17-22, 58-66 *supra*), the Commission gave absolutely no consideration to revising its methodologies, to jus-

tifying its rule with reasoned conclusions drawn from the record, or to expanding the scope of rulemaking to include both a detailed analysis of controverted issues and a presentation of the full dimensions of the radioactive waste disposal problems. Affirmance of the assumptions and methodologies used by the Commission to support its minimal consideration of the environmental impact of producing radioactive wastes would substitute a rule of expertise by speculation in place of a rule of law by full disclosure. By passing NEPA, Congress established its unwillingness to make this substitution.

IV. CONCLUSION

For the reasons stated above, the decisions of the Court of Appeals on review in No. 76-419 should be affirmed and the case remanded to the Nuclear Regulatory Commission for further proceedings consistent with the opinion of this Court.

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In the Supreme Court of the United States

OCTOBER TERM, 1976

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Pursuant to this Court's Rule 42, Edison Electric Institute ("EEI"), and Commonwealth Edison Company, Consolidated Edison Company of New York, Inc., Niagara Mohawk Power Corporation, Omaha Public Power District, The Power Authority of the State of New York, and Rochester Gas and Electric Corporation ("the Utilities") hereby move the Court for leave to file the brief of *amici curiae* bound with this motion. Consent was refused by counsel for Natural Resources Defense Council, *et al.*, parties to the cases which are the subjects of Petition Numbers 76-419 and 76-548. EEI and the Utilities have received the written consents of counsel for all other parties to these cases to file the brief *amici curiae*. Copies of the consents have been filed with the Clerk. The brief urges the Court to grant the petitions.

EEI and the Utilities have an interest in this Court's disposition of the Petitions for Writs of Certiorari to the judgment and opinion of the United States Court of Appeals for the District of Columbia Circuit in *Natural Resources Defense Council, Inc., et al. v. United States Nuclear Regulatory Commission,* No. 74-1385, and *Natural Resources Defense Council, Inc. and Consolidated National Intervenors v. United States Nuclear Regulatory Commission,* No. 74-1586 (D.C. Cir. July 21, 1976).[1] This interest arises from the participa-

[1] The slipsheet copy of the opinion is set out at Appendix to the Vermont Yankee Petition for a Writ of Certiorari to the United States Court of Appeals for the District of Columbia ("Pet. App.") A-1 to A-59 (*filed,* U.S. September 21, 1976) (No. 76-419). *See* Petitioner's Supplemental Brief and Supplemental Appendix, (*filed,* U.S. December 6, 1976) (No. 76-419) for a discussion of subsequent procedural developments. In addition to the Vermont Yankee and Baltimore Gas and Electric petitions, there are two other related petitions for writs of certiorari: Nos. 76-528 and 76-745.

tion by EEI and the Utilities in the rulemaking proceeding before the Atomic Energy Commission [2] which was reviewed by the court of appeals in the aforementioned opinion, from the participation by the Utilities as *amici curiae* in that review by the court of appeals,[3] from the status of the Utilities and many of EEI's members as licensees and applicants for licenses for nuclear power plants, and from EEI's concern with the development of sound policies and procedures for the regulation of the electrical utility industry.

EEI is the principal national association of electric utility companies. EEI members represent 99.1% of all customers of the investor-owned segment of the electric utility industry and 77.1% of the Nation's electricity users. These member companies are licensees or applicants for licenses for 178 of the 205 commercial nuclear power units currently licensed by, or in licensing before, the Commission.[4] Among EEI's interests are the development of sound policies and procedures for regulation of the construction of nuclear power plants and the production and generation of electricity through the use of nuclear power.

The Utilities are investor-owned and public entities that construct and operate power plants to provide

[2] URANIUM FUEL CYCLE, USAEC Docket No. RM-50-3, Letter from Arvin E. Upton, Esq., transmitting Written Comments of Alabama Power Company, *et al.* (January 15, 1973); Oral Comments of Arvin E. Upton, Esq., Tr. 12-14, 35, 46-47 (January 17, 1973); Supplementary Written Statement of Alabama Power Co., *et al.* (March 19, 1973).

[3] Brief of *Amici Curiae,* NRDC v. AEC, No. 74-1586, (*filed,* D.C. Cir. December 9, 1974).

[4] USNRC, FACILITIES LICENSE APPLICATION RECORD (September 30, 1976).

electricity to their customers. Each of the Utilities has an interest in one or more nuclear power plants for which construction permits or operating licenses have been issued by the Commission or for which construction permit applications are pending before the Commission.[5] The Utilities collectively have invested billions of dollars on those plants.[6]

EEI and the Utilities have carefully reviewed the Petitions for Writs of Certiorari and the Petitioner Vermont Yankee's Supplmental Brief, as well as the responses of the federal and non-federal respondents. EEI and the Utilities respectfully submit that their brief lodged herewith presents a different and relevant statement of the issues in the petitions and an additional issue with respect to the correctness of the remedy prescribed by the court of appeals. It is the view of EEI and the Utilities that the Court need not reach the issue whether simple notice and comment procedures would have been sufficient as suggested or the issue whether the "hybrid" procedures discussed in *International Harvester Co. v. Ruckelshaus,* 478 F.2d 615 (D.C. Cir. 1973), were followed. Rather EEI and the Utilities would have the Court consider whether the procedures actually used by the Commission were sufficient.

---

[5] The Utilities hold operating licenses for fourteen nuclear power units (9,075 megawatts ("MWe")), construction permits for seven units (7,736 MWe) and have applications in earlier stages of licensing review for three units (3,477 MWe).

[6] At an estimated value of $680 per kilowatt, the Utilities' nuclear power units represent an investment of approximately $14 billion in 1974 dollars. *See* USAEC, THE NUCLEAR INDUSTRY 1974, WASH 1174-74 (1974), Table 2-2.

For these reasons, EEI and the Utilities respectfully urge the Court to grant this motion for leave to file their brief, bound with this motion, as *amici curiae.*

Respectfully submitted,

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INTEREST OF *AMICI CURIAE*

The interest of the *amici curiae* is stated in their motion for leave to file this brief, which is bound together with the brief.

SIGNIFICANCE OF THE DECISION BELOW

The court of appeals set aside and remanded the Commission's [1] rule due to alleged failings in the treatment of environmental impacts of radioactive waste disposal and reprocessing, and remanded the full-term operating license of the petitioner, Vermont Yankee Nuclear Power Corporation, to await the outcome of further proceedings in the rulemaking.[2] If this decision is allowed to stand it will have serious consequences in subjecting the Commission and other agencies to an unknowable procedural burden which agency caution is sure to convert into delays. Such delays will have an impact not only on those entities directly involved in nuclear power plant licensing proceedings before the Commission, but also upon consumers of electricity throughout the country and all other regulated industries.

BACKGROUND

During the proceedings to determine whether to issue an operating license for the Vermont Yankee Nu-

[1] The term "the Commission" is used herein to refer to both the U.S. Atomic Energy Commission ("AEC") and the agency that succeeded to its regulatory responsibilities on January 19, 1975, the U.S. Nuclear Regulatory Commission ("NRC"). 42 U.S.C. §§ 2011-2282 (1970 & Supp. V 1975); Pub. L. No. 93-438, 88 Stat. 1233 (codified in scattered sections of 5, 40, 42 U.S.C.); Exec. Order No. 11,834, 3A C.F.R. 111 (1975), *reprinted in* 42 U.S.C. § 5801 app., at 3866 (Supp. V 1975).

[2] Pet. App. A-44; Pet. App. A-13.

clear Power Station, an intervenor raised the question whether certain environmental impacts associated with the reactor's fuel, but which occur away from the plant site in separately licensed activities, should be part of the Commission's environmental analysis of the power plant pursuant to the National Environmental Policy Act of 1969 [3] ("NEPA").

The Commission's Atomic Safety and Licensing Appeal Board concluded on June 6, 1972 that some such environmental costs should be included but that others should not be included.[4] In particular, the Appeal Board decided to include the impacts of transportation of spent fuel, low-level wastes, and high-level wastes from the reactor to their respective destinations in the cost-benefit analysis of the reactor, but to exclude the environmental impacts of the reprocessing plant and waste disposal facilities. Pet. App. A-63.

Five months later the Commission initiated the rulemaking that is the subject of the opinion below. 37 Fed. Reg. 24,191 (November 15, 1972) (Pet. App. A-121). In its notice, the Commission recognized that, in several licensing proceedings, intervenors had raised the question whether the environmental effects of distinct and geographically unrelated activities which comprise the uranium fuel cycle [5] should be included

[3] 42 U.S.C. §§ 4321-4347 (1970 & Supp. V 1975); *see* Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109 (D.C. Cir. 1971).

[4] Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-56, 4 AEC 930 (1972), Pet. App. A-60 to A-77; Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station) ALAB-179, 7 AEC 159 (1974), Pet. App. A-78 to A-120.

[5] These activities cover, in industrial sequence, mining of urani-

in the cost-benefit analysis of each reactor. The Commission went on to state that it was considering a rule to amend its regulations on environmental matters in one of two ways.[6] The first alternative was to exclude the consideration of these fuel cycle activities on the basis that a reactor's annual share of the environmental impacts of the supporting activities is "sufficiently small as not to affect significantly the" decision whether to approve construction and operation of the reactor. Pet. App. A-125. The second alternative was to include a calculation of normalized [7] impacts in the en-

um ore, extraction of triuranium octoxide (U_3O_8) from that ore in the milling process, conversion of the U_3O_8 to a gas (uranium hexaflouride or UF_6), enrichment (concentration) of the U_{235} contained therein from its natural concentration (approximately 0.711 percent) to approximately 2-4 percent, and then its fabrication as fuel by a) re-conversion into the solid uranium dioxide (UO_2), b) pelletization, and c) insertion into fuel rods for use in the reactor After the fuel is used in the reactor it may be stored permanently, or reprocessed for the reuse of some parts and the storage of the remainder.

[6] The participants in the rulemaking were not forbidden from presenting other alternatives. A third alternative was presented and rejected by the Commission. Pet. App. A-137.

[7] The concept of "normalization" is important to an understanding of the rulemaking. With respect to both the scale and processes of the reactor and the fuel cycle activities, the Commission chose characteristics which were representative of the present industry to emphasize the most severe impact. This results in a conservative (or high) estimate of the overall impact.

An example of this approach is the choice of shorter useful lives for various activities than experience would indicate. This factor alone exaggerates the fixed environmental costs. For example, the land use for each of the supporting activities (except waste management where the commitment was permanent) was exaggerated by estimating a useful life of only 20 years. USAEC, ENVIRONMENTAL SURVEY OF THE NUCLEAR FUEL CYCLE (November 1972) ("Original Environmental Survey") S-1 to S-48; USAEC, ENVIRONMENTAL SURVEY OF THE URANIUM FUEL CYCLE, WASH-1248

vironmental statement on each reactor. That normalized statement of numerical values would cover the various environmental impacts of conducting all the fuel cycle activities which occur beyond the power reactor site boundary. The proposed impact table also would put those numbers in perspective by comparison with the impacts of other more familiar activities, such as, coal plants, natural background radiation, and the reactor itself.[8] Pet. App. A-262. The technical basis for both alternatives, the 310 page double-spaced Original Environmental Survey, was published at the same time.

To receive comments on the proposed rule, the Commission appointed a three-member hearing board.[9] All interested persons were invited to submit oral or written statements at a legislative "rather than an adjudicatory hearing" to begin on February 1, 1973. Pet. App. A-127 to A-128. The initial written comments were requested by January 14, 1973. *Id.*

The Commission later issued further procedural instructions directing that the hearing should be "conducted as informally and as expeditiously as practicable, consistent with affording the participants a reasonable opportunity to present their positions." Pet.

(1974) ("Final Environmental Survey") S-1 to S-33. As the Commission said in its decision, these calculations were only intended to be descriptive in generating conservative terms and were not intended to be actual costs for any particular reactor and were not intended to set licensing limits. Pet. App. A-140.

[8] This comparative approach is in line with the Council on Environmental Quality's Guidelines ("CEQ Guidelines") on the preparation of environmental impact statements. 40 C.F.R. Part 1500.8 (1976).

[9] The board was appointed by notice at 38 Fed. Reg. 49 (1973) (Pet. App. A-130).

App. A-131. In addition, the Commission said that both oral and written statements would be "subject to questioning" by the board. *Id.* The board was empowered to hold one or more procedural planning sessions; such a session was held on January 17, 1973. Then the board was to hold an oral hearing and, after allowing thirty days further for the submission of supplementary written statements, the board was directed to forward the entire record to the Commission accompanied by an identification of the issues but without any recommendation or initial decision from the board. The Commission itself would make the decision. Pet. App. A-132. The oral hearing was held on February 1 and 2, 1973, and all parties were allowed the *full* time for oral presentation which they requested.[10]

The non-federal respondents in this Court requested, and were granted, an extension of time in which to file their supplemental written statement.[11] On July 6, 1973, the board forwarded the record to the Commission with the board's report identifying nine issues to be considered by the Commission. Pet. App. A-136 to A-146.

On April 16, 1974, the Commission issued the final rule accompanied by a 260 page single-spaced Final Environmental Survey to take account of information made available during the rulemaking. 39 Fed. Reg. 14,188 (1974) (Pet. App. A-133 to A-134). The Commission briefly discussed all issues identified by the board and concluded that, although the sum of these

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[10] URANIUM FUEL CYCLE, USAEC Docket No. RM-50-3, Tr. 9-26 (January 17, 1973).

[11] URANIUM FUEL CYCLE, USAEC Docket No. RM-50-3, Motion of Consolidated National Intervenors/Union of Concerned Scientists in Request of Schedule Rearrangement (February 27, 1973) and Order Granting Extension of Time (March 9, 1973).

fuel cycle costs is "relatively insignificant" in the consideration of whether to license a power reactor, the Commission "favors" the approach of the second alternative because "it quantifies, to the fullest extent practicable, the environmental effects of the uranium fuel cycle in individual cost-benefit analyses." Pet. App. A-143 to A-144.

The non-federal respondents in this Court filed a petition for review of the final rule in the court of appeals on June 7, 1974. That proceeding was consolidated with the petition for review of the Vermont Yankee license, and oral argument was held May 27, 1975. The decision below, which is the subject of the petitions for writs of certiorari, issued July 21, 1976.

ARGUMENT

I.

THE COURT OF APPEALS ERRED IN REQUIRING ORAL PROCEEDINGS ON REMAND AND IN CURBING THE COMMISSION'S DISCRETION IN RULEMAKING PROCEDURES.

On the procedural issues, the court of appeals' judgment and opinion is inconsistent with this Court's interpretations of the Administrative Procedure Act because it would require oral proceedings and otherwise restrict the Commission's statutory latitude as to the procedure for a rulemaking to estimate environmental impacts under NEPA. The opinion below also offends reason in suggesting that trial-type procedures are required for the consideration of a developing technical area, the long-term storage of high-level waste, while finding the Commission's procedures adequate for those areas of the uranium fuel cycle where tech-

nology has already matured into actual, licensed facilities. That is, the opinion appears to require trial-type examination of conceptual design but not of fully developed engineering and hardware. Finally, the opinion below is inconsistent with the opinion of this Court in *FPC v. Transcontinental Gas Pipe Line Corp.*, 423 U.S. 326, 333 (1976), which requires the courts of appeals to restrain themselves from dictating administrative procedures on remand.

This Court should reverse the decision of the court of appeals and find that the combination of procedures employed by the Commission in this instance was appropriate to the task at hand. In so doing, this Court need not reach the issue whether notice and opportunity for written comment would have sufficed because the Commission went further. *See United States v. Allegheny-Ludlum Steel Corp.*, 406 U.S. 742 (1972); *United States v. Florida East Coast Railway*, 410 U.S. 224 (1973). Furthermore, this Court need not reach the issue whether the "hybrid" procedures developed pursuant to *International Harvester Co. v. Ruckelshaus*, 478 F.2d 615 (D.C. Cir. 1973), were followed in this instance because they are neither necessary nor appropriate to this type of administrative action.

While the court below professed restraint from "intrud[ing] on the agency's province by dictating to it which, if any, of [certain] procedural devices it must adopt to flesh out the record," it did so intrude by holding that an oral proceeding would be required on remand. Pet. App. A-40; A-42 n.62. The opinion immediately reiterates that it does "not intimate that [the Commission] must adopt any of" the procedures set out in note 15 *infra*. However, this avails little in the face of the holding that oral proceedings are required.

In his *"separate statement concurring in result"*, Judge Tamm wrote: "More procedure will not, in this case, guarantee a better record, and a better record can be generated without reopening the oral proceeding at this time." Pet. App. A-53. In the "Opinion for the Court," Chief Judge Bazelon held:

> Evidently Judge Tamm would permit Dr. Pittman to supplement his testimony without giving those who disagree an opportunity to criticize or comment on the new material (*e.g.*, 'without reopening the oral proceeding,' Concur at 3). *We would not agree.* Pet. App. A-42 n.62 (emphasis added).

The conclusion that oral proceedings are necessary to the rulemaking rejects the flexibility accorded to agencies by Section 553 of the Administrative Procedure Act to have notice and comment procedures "with or without opportunity for oral presentations." 5 U.S.C. § 553(c) (1970 & Supp. V 1975).

In this matter, we respectfully suggest the analysis of the United States [12] is in error: The United States relies on Judge Tamm's statement in place of the "Opinion for the Court." Yet there was a clean line of dispute between the "Opinion for the Court" which found that oral proceedings would be necessary and Judge Tamm's *"separate statement concurring in result"* which said they should not be necessary. For the same reason, the analysis by respondents Natural Resources Defense Council, *et al.*, is incorrect. Brief in

[12] Brief for the Federal Respondents 9-10. Indeed, even assuming that a holding of record deficiency can be discerned from the opinion as corrected, that holding is, at best, an alternative holding that does not vitiate the clear direction of the court that proceedings on remand must include oral proceedings.

Opposition 3-5. This holding flatly usurps the discretion accorded the Commission under its own statute [13] and the Administrative Procedure Act,[14] which discretion has been recognized by the same court of appeals. *See, e.g., Siegel v. AEC,* 400 F.2d 778, 785 (D.C. Cir. 1968).

The opinion below did not stop there: it went on to enumerate most, if not all, of the significant procedural devices developed in the history of the common law [15] and concluded "It may be that no combination of the procedures mentioned above will prove adequate, and *the agency will be required to develop new procedures* to accomplish the innovative task of implementing NEPA through rulemaking." Pet. App. A-40 (emphasis added). This observation was coupled with the not entirely optimistic statement that the Commission's original procedures (notice with written and oral comment) "might suffice" if they were "administered in a more sensitive, deliberate manner." *Id.* This language of the opinion does not have any of the optimistic tone inferred by the United States in the Brief for the Federal Respondents. Brief for the Federal Respondents 9-10. This obsession of the United States Court of Appeals for the District of Columbia Circuit with "inno-

[13] 42 U.S.C. § 2239(a) (1970).

[14] 5 U.S.C. § 553 (1970 & Supp. V 1975).

[15] The opinion below reads: "Many procedural devices for creating a genuine dialogue on these issues were available to the agency—including informal conferences between intervenors and staff, document discovery, interrogatories, technical advisory committees composed of outside experts with differing perspectives, limited cross-examination, funding independent research by intervenors, detailed annotation of technical reports, surveys of existing literature, memoranda explaining methodology." Pet. App. A-40.

vative" devices, or *ad hoc* procedures, has been criticized by many authorities. *See, e.g.,* DAVIS, ADMINISTRATIVE LAW OF THE SEVENTIES 668 (1976); Wright, *The Courts and the Rulemaking Process: The Limits of Judicial Review,* 59 CORNELL L. REV. 375 (1974). If the court of appeals is allowed to continue down this path, it will only serve to erode, if not destroy, the utility of rulemaking as a regulatory tool. In this respect, the Commission's view of the decision below is far more important than the United States' interpretation, since it is the Commission's view which will govern future administrative procedings unless the decision below is reversed.

The asserted basis for the procedural approach taken by the court of appeals in the decision below is a line of decisions in that Circuit (*e.g., International Harvester Co. v. Ruckelshaus, supra*) and one decision of the Fourth Circuit, all of which require or approve "hybrid" rulemaking in the context of the statutes there in question. Pet. App. A-16 n.23. This Court need not, however, consider whether the Commission sought to follow such procedures on paper but failed to administer them properly. Pet. App. A-40 n.59. Those so-called *International Harvester* procedures were developed in the context of particular statutes (which do not apply here) that required specific findings to be made in reaching individual decisions where, in some instances at least, there would be an individualized economic effect.[16] Thus, even if "hybrid" procedures

[16] This summary is not intended to indicate that the hybrid approach is limited to this particular combination of circumstances. On the other hand, it is intended to indicate that something more is needed for resort to these procedures than a robot-like invocation that the question at issue is a "technological" one.

were appropriate in those decisions on the basis of the particular statutes and perhaps on the basis of considerations of due process, such bases do not exist in this case. *See United States v. Florida East Coast Railway,* 410 U.S. at 244-46. Here, by contrast, the Commission's purpose was to develop, under its flexible rulemaking authority, a description [17] of some of the indirect or secondary impacts to be included in the *Calvert Cliffs'* cost-benefit analysis [18] for individual reactors.

Moreover, the procedures suggested by the court of appeals are wholly inappropriate to estimate the environmental impacts of a facility for the long-term storage of high-level wastes. Such a facility has never been constructed in this country. At the time of the rulemaking, the conceptual design stage had just been reached as the decision below recognizes. Pet. App. A-25 to A-26. Thus, there were no engineering details con-

[17] The Commission explicitly said in its Statement of Consideration on the final rule ". . . the Environmental Survey and the Summary Table of Values are purely descriptive and are not intended as operating limits which may be imposed in licensing and regulatory actions with respect to the various fuel cycle facilities." Pet. App. A-144.

[18] The CEQ Guidelines indicate that environmental statements should cover the secondary or indirect consequences of the proposed action for the environment. 40 C.F.R. § 1500.8(a)(3)(ii) (1976). This concept of a cost-benefit analysis originated not in NEPA but in the language of the *Calvert Cliffs'* opinion. Calvert Cliffs' Coordinating Comm. v. AEC, 449 F.2d at 1113. However, the impacts discussed in this rule may go beyond the relatively limited geographical concept stated in the CEQ Guidelines (*e.g.*, "the area in question"), although they may be included in the concept of "infrastructure." 40 C.F.R. § 1500.8(a)(3)(ii) (1976). Further, the *Calvert Cliffs'* interpretation of NEPA requirements is in doubt. *Cf., e.g.*, Aberdeen & Rockfish R.R. v. Students Challenging Regulatory Agency Procedures (S.C.R.A.P.), 422 U.S. 289, 321 n.20 (1975) ("SCRAP II").

cerning the precise environmental impacts of building and operating such a plant." [19] The court of appeals did not discuss the procedures as applied to fuel cycle activities other than reprocessing and waste management. In fact, the opinion below appears to find that the Original Environmental Survey was sufficient in itself to support "the staff's conclusions" without resort to the written comments, the oral proceedings, or the changes reflected in the Final Environmental Survey. Pet. App. A-24.

Finally, the decision below indicates that the determination of normalized environmental impacts requires resort to special, but perhaps unknown, procedures due to the "innovative task of implementing NEPA through rulemaking." Pet. App. A-40. To the contrary, NEPA requires no special procedures but rather may be fulfilled through the normal procedures utilized by the agency in carrying out its substantive responsibilities. *Union of Concerned Scientists v. AEC,* 499 F.2d 1069, 1078-79 (D.C. Cir. 1974). Nor is there anything unusual about an agency, especially one with "broad responsibility . . . free of close prescription" such as the Commission, relying on expert judgment in finding such normalized facts as the indirect impacts involved here, rather than insisting upon cross-examination before doing so.[20]

[19] This is not the same as an absence of facts on the storage of wastes. See note 23 *infra.*

[20] Siegel v. AEC, 400 F.2d at 785. This view of the special latitude afforded the Commission has been repeatedly cited by the courts of appeals. *See, e.g.*, BPI v. AEC, 502 F.2d 424, 428 n.3 (D.C. Cir. 1974).

II.

THE COURT OF APPEALS IMPROPERLY APPLIED THE "ARBITRARY" OR "CAPRICIOUS" STANDARD TO THE COMMISSION'S NEPA DESCRIPTION OF CERTAIN FUEL CYCLE IMPACTS.

The court below applied incorrect legal principles to determine whether the Commission had sufficient basis for the normalized factual conclusions which it reached in describing, for the purposes of NEPA, the impacts of reprocessing and waste disposal. Pet. App. A-44.

With respect to the long-term storage of high-level radioactive wastes, the court of appeals devoted a major part of its opinion to a discussion of the lack of detailed information on the facilities and of the absence of a "genuine dialogue" or adversary debate about the "basic philosophical issues concerning man's ability to make commitments which will require stable social structure for unprecedented periods." Pet. App. A-36. The decision below also said that the Commission had inadequately articulated its reasoning and failed to specify the evidence on which it relied. Pet. App. A-42. However, the principal specific criticism of the record was withdrawn by the court in its order of October 8, 1976, correcting the opinion. Petitioner Vermont Yankee's Supplemental Appendix SA-1 to SA-2.

With respect to the alleged inadequacy of the Commission's findings on the impact of reprocessing, the decision below contains nothing but a conclusory statement of inadequacy.[21]

[21] In Part III of the opinion below (which deals with the rulemaking), the court of appeals mentioned the word "reprocessing" seven times and gave only one hint why the treatment of reprocessing was deemed inadequate. Pet. App. A-24 (twice), A-28, A-33 (twice), A-35, A-41, and A-44. In footnote 51, the opinion cites a government report issued one year *after* the final rule which stated that " 'there are still many technical problems and uncertainties in the overall area of processing of spent fuel and properly managing its radioactive waste.' " Pet. App. A-33. The fact that there are "technical problems and uncertainties" does not vitiate the ability of the Commission to make an adequate estimate of the environmental effects of reprocessing on the basis of its experience, for the purpose of NEPA disclosure.

These conclusions are inconsistent with this Court's directives on how a reviewing court should determine whether there is sufficient support in the record for an agency's decision. Further, the decision below places a burden on the Commission and other agencies in providing information for NEPA consideration which is contrary to the interpretation of NEPA by this Court.

In general, the Commission based its final conclusions on the full rulemaking docket and on its expertise. *See SCRAP II, supra* note 18, at 320-21. The Commission's rulemaking decision has as its basis the 260 page single-spaced Final Environmental Survey, the written comments of 46 participants and the Regulatory Staff, the 520 page transcript of the oral proceedings, all documents referenced in the foregoing, the board's report to the Commission, and finally, the 4,000 word Statement of Consideration issued by the Commission with the final rule. These materials included supplementary information filed to correct the deficiency, alleged by one board member, in the waste management discussion in the Original Environmental Survey.

In its Statement of Consideration, the Commission addressed all nine issues identified by the board in an adequate, if brief, fashion. Pet. App. A-136 to A-145.

The opinion of this Court in *Camp v. Pitts,* 411 U.S. 138, 143 (1973), indicates that while the agency is required to state its rationale, that statement may even be "curt." The agency is not required to state its findings in the detail required of a trial judge sitting without a jury; rather the reviewing court is to survey the "administrative record" as a whole. *Id.* at 142.

The court of appeals has previously held that there is "some degree of flexibility and agency discretion in determining the content of impact statements." *Scientists' Institute for Public Information, Inc. v. AEC,* 481 F.2d 1079, 1091 (D.C.Cir. 1973) *("SIPI"),* and that "[t]he statute must be construed in the light of reason if it is not to demand what is fairly speaking, not meaningfully possible. . . ." *Natural Resources Defense Council, Inc. v. Morton,* 458 F.2d 827, 837 (D.C. Cir. 1972). Thus, the court of appeals in *SIPI* found that NEPA requires only ". . . a good faith effort in the survey to describe the reasonably foreseeable environmental impact of the program." 481 F.2d at 1092. These decisions indicate that even a lesser level of detail is necessary in the record for direct impacts of a project than the court below would require for indirect impacts, stated in a normalized format.

As to the impacts of both reprocessing and long-term wastes attributable to a hypothetical reactor, the court below said that the "kind of detailed explanation and support for the staff's conclusion [for the other phases of the fuel cycle] was noticeably absent from the Environmental Survey *as originally published."* Pet. App. A-24 to A-25 (emphasis added). However, this ignores the true question: the sufficiency of detail in the Final Environmental Survey and the entire administrative record.[22] Further, the sufficiency of the record on these two fuel cycle activities should be judged in the light of the type of factual information available on reprocessing and long-term storage of high-level waste at that time. Only one civilian reprocessing facility had ever operated (two were in the licensing process), and no permanent long-term high-level waste storage facility had been built. Pet. App. A-25 to A-26. Thus, the conclusions of the staff witnesses and, ultimately, the Commission as to those two stages of the fuel cycle were necessarily based, to a greater degree, on judgment and conceptual analysis. In contrast, there were 222 mines (Original Environmental Survey, A-8), approximately 20 mills (Original Environmental Survey, B-7), two conversion plants with a total production of 10,000 metric tons per year (Original Environmental Survey, C-2), three enrichment plants that had operated for nearly 70 plant years[23] (Original Environmental Survey, D-1),

[22] There was a considerable difference between the Original and Final Environmental Surveys in the degree of detail afforded the discussion of reprocessing and waste management. *Compare* Original Environmental Survey, Table S-3A and Chapters F and G, *with* Final Environmental Survey, Table S-3A and Chapters F and G. For example, in volume terms, the original devoted 58 double-spaced pages to the discussion of these subjects while the final had 61 single-spaced pages of discussion. And while, in the Original Environmental Survey, the Commission had discussed explicitly only its experience in the civilian power reactor program, the Final Environmental Survey also discussed and relied on the more extensive experience in the Government's own program of reprocessing and waste management since the 1940's. *See* Final Environmental Survey, F-15 through F-19.

[23] USAEC, AEC Gaseous Diffusion Plant Operations, (ORO-684), 11-13 (January 1972).

and ten fuel fabrication plants (Original Environmental Survey, E-7).

In reaching its conclusions with respect to the impacts of reprocessing, the Commission relied on its experience with the operation of the one plant and the design and construction of the other two (Final Environmental Survey, Section F), as well as the extensive experience since the 1940's with high-level wastes in the Government program, and took only minimal credit for currently developing improvements in technology (Final Environmental Survey, S-2). Further, the Commission took specific account of the respondent's criticisms of the reprocessing calculations in the Final Environmental Survey and recognized them in its Statement of Consideration. Pet. App. A-141 n.3.

The Commission's estimate of the impacts of long-term high-level waste storage were perforce made on the basis of design concepts and analyses, but NEPA requires no more. The court below fails to recognize that the Commission was not considering the approval of the long-term waste storage facility, and thus the "factual predicate" necessary for detailed analysis was absent. *Cf., Kleppe v. Sierra Club,* —— U.S. ——, ——, 96 S. Ct. 2718, 2727 (1976); *Natural Resources Defense Council, Inc. v. Morton,* 458 F.2d at 837 ("... more germane to subsequent proposals . . ., in the light of changes in technology or in [other] variables. . . ."). Rather the Commission was making descriptive estimates from experience with the storage of high-level wastes in the Government program, as well as at the only civilian reprocessing plant to have operated to date, and its relied on that experience. Pet. App. A-141 n.3. Such wastes will be kept at the reprocessing plant

until a long-term storage facility is constructed by the Energy Research and Development Administration and licensed by the Commission.[24] Until a definite design and location is proposed, one cannot determine answers to the questions on the details of high-level waste management posed by the court below.[25] Nor does NEPA require such answers. "Certainly NEPA does not require the Commission to forecast the deployment and effects of LMFBR power reactors in the year 2000 in the same detail or with the same degree of accuracy as another agency might have to forecast the increased traffic congestion likely to be caused by a proposed highway." *SIPI,* 481 F.2d at 1092. The Commission and the Energy Research and Development Administration are currently pursuing their respective licensing and management responsibilities for high-level wastes and reprocessing. More detailed environmental treatment will be accorded these subjects in those "more appropriate" proceedings. *SCRAP II, supra* note 18, at 322-28.

The estimate given by the Commission based on its expertise and experience with military and civilian high-level wastes was sufficient for the task at hand. When only facts on the frontier of science are available, the rulemaking must "depend to a greater extent upon policy judgments and less upon purely factual analysis." *Industrial Union Department v. Hodgson,* 499 F.2d 467, 474 (D.C. Cir. 1974). This is not to say, of course, that the Commission is proceeding in the absence of reasonable near-term and intermediate-

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[24] The Commission's regulations currently require this approach. 10 C.F.R. Part 50, Appendix F (1977).

[25] *See* Kleppe v. Sierra Club, —— U.S. at ——, 96 S.Ct. at 2727.

term solutions. The Commission has had experience with the management of high-level wastes since the 1940's. The current inventory of high-level wastes from the Government programs is approximately 75.6 million gallons, or more than *ten times* the amount of such waste that will be generated by the entire civilian nuclear power industry by the year 2000. *ERDA Authorizing Legislation Fiscal Year 1977: Hearings Before the Subcomm. on Legislation of the Joint Comm. on Atomic Energy, Part 2,* 94th Cong., 2d Sess., Chart VII at 1460, 1464 (1976).

Moreover, it is to be hoped that the court of appeals is not correct in assuming that the assessment of environmental impacts must entertain philosophical debates as to whether our society will remain stable for 250,000 years. Pet. App. A-36. Such an exercise would surely be a sally into the unforeseeable. *SIPI,* 481 F.2d at 1092. The Commission satisfied NEPA when it described the radionuclides and other impacts, including the commitment of land as "permanent."[26] The court of appeals has approved a Commission rule which excludes considerations of war from the health and safety review of reactors. *Siegel,* 400 F.2d at 784. If the Commission can exclude from consideration such a drastic condition, which is nonetheless within our experience, in carrying out its basic health and safety responsibilities, it can surely decline to debate whether the Constitution will endure for 250,000 years.

[26] *See* Table S-3 (Pet. App. A-148), and corresponding Regulation (Pet. App. A-261 to A-262).

III.

THE COURT OF APPEALS MISAPPREHENDED A DECISION OF THIS COURT IN DECIDING THE RULE SHOULD BE VACATED.

Assuming *arguendo* that the court of appeals was correct in finding the rulemaking procedures lacking and the amount of information on long-term, high-level waste storage inadequate, the separate statement of Judge Tamm was correct in arguing that the rule should not have been vacated. The majority below erred in applying *Camp v. Pitts,* 411 U.S. at 143.[27] In that case the "'vacating" of the "rule" did not change the *status quo:* The Comptroller of the Currency had denied Pitts the bank charter which he sought; the remand did not give Pitts that charter but, at most, required that the matter be looked at again by the Comptroller "for further consideration." That is precisely what Judge Tamm argued the court of appeals should have done here.

To remand the rule without vacating it is not always an appropriate remedy, but it is in this case. The rule did two things: It quantified a hypothetical reactor's share of the impacts of all seven supporting activities of the fuel cycle and the attendant transportation, and it concluded that the sum of all eight of those indirect impacts was insignificant in the cost-benefit analysis of a reactor. Before the opinion was corrected, the court below faulted the development of the record with respect to the questioning of one witness on the impact quantification of only parts of

[27] The opinion below also relies on FPC v. Transcontinental Gas Pipe Line, *supra.* Pet. App. A-44, n.65. In that case, the *status quo* was preserved effectively by the establishment of an escrow for the amount of money in dispute. *Id.* at 328 n.1.

two of those eight supporting activities, but found that the Commission's statement as to the total of those costs was a "fair summary." Pet. App. A-15. The court of appeals also upheld the Commission's determinations of all the other fuel cycle impacts. In these circumstances, it would be extremely difficult to conclude that the overall conclusion could be significantly altered by further consideration.

In short, since the court of appeals found no substantial fault with the rule as a whole, vacating it was inappropriate. The court of appeals should, at most, have remanded the rule for further proceedings without vacating it.

The truly dangerous potential of this decision is in the unpredictable procedural burden which the court of appeals is placing on the Commission and other agencies in the future. This danger is further magnified by the inappropriate remedy.

CONCLUSION

For the reasons stated above, as well as those stated by the Petitioners and the Nuclear Regulatory Commission, the petitions for writs of certiorari should be granted.

Respectfully submitted,

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